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=> file reg
FILE 'REGISTRY' ENTERED AT 10:48:34 ON 13 FEB 2004
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=> display history full l1-


     FILE 'REGISTRY' ENTERED AT 09:41:21 ON 13 FEB 2004
L1             51 SEA (GA(L)N)/ELS (L) 2/ELC.SUB
L2              0 SEA L1 AND ATOMIC#

     FILE 'HCA' ENTERED AT 09:56:26 ON 13 FEB 2004
L3          22333 SEA L1 OR (GALLIUM# OR GA)(W)NITRIDE# OR GAN
L4         112616 SEA POLYCRYST? OR POLY(A)CRYST?
L5          15108 SEA (ATOMIC? OR AT)(2A)(FRACTION? OR RATIO? OR PROPORTION
                  ?)
L6                QUE DENS? OR D OR (G OR GR OR GM# OR GRAM#)(A)(CM3 OR
                  CENTIM?)
L7          18435 SEA VICKER##
L8         165114 SEA HARDNESS?
L9          17941 SEA ISOSTATIC? OR ISO(A)STATIC? OR HIP OR H(W)I(W)P
L10           387 SEA L3 AND L4
L11             1 SEA L10 AND L5
L12            34 SEA L10 AND L6
L13             2 SEA L10 AND (L7 OR GPA)
L14             1 SEA L10 AND L8
L15               QUE DENS? OR (G OR GR OR GM# OR GRAM#)(A)(CM3 OR
                  CENTIM?)
L16            10 SEA L10 AND L15
L17             1 SEA L10 AND L9

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L18           179 SEA D EVELYN ?/AU OR DEVELYN ?/AU OR EVELYN ?/AU
L19           176 SEA PENDER ?/AU
L20            34 SEA VAGARALI ?/AU
L21         62772 SEA PARK ?/AU
L22             1 SEA L18 AND L19 AND L20 AND L21
                  D ALL

     FILE 'REGISTRY' ENTERED AT 10:08:12 ON 13 FEB 2004
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L24             1 SEA L23 AND L1
L25           259 SEA (B(L)N)/ELS (L) 2/ELC.SUB

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L26       30257 SEA L25 OR (BORON## OR B)(W)NITRIDE# OR BN
L27        2120 SEA VYCOR#
L28      694629 SEA HP OR H(W)P OR HT OR H(W)T OR HIGH?(2A)(PRESS? OR
                TEMP?)
L29      196190 SEA SINTER?
L30          18 SEA L10 AND L26
L31           1 SEA L10 AND L27
L32          40 SEA L10 AND L28
L33           4 SEA L10 AND L29
L34           2 SEA L12 AND L30
L35           6 SEA L12 AND L32
L36           2 SEA L30 AND L32
L37          46 SEA L10 AND ATOMIC?
L38          12 SEA L37 AND (L6 OR L7 OR GPA OR L8 OR L9 OR L15 OR L26
                OR L27 OR L28 OR L29)
L39          12 SEA L37 AND (L12 OR L30 OR L32)
L40        6343 SEA EQUIAX?
L41             QUE SMOOTH? OR ROUGH?
L42      118499 SEA COLD?(2A)PRESS? OR PILL OR PILLS OR PELLET? OR BB OR
                BBS
L43       22957 SEA COLD?(2A)PRESS? OR PILL OR PILLS OR BB OR BBS
L44           0 SEA L10 AND L40
L45          36 SEA L10 AND L41
L46           0 SEA L10 AND L42
L47           0 SEA L10 AND L43
L48          16 SEA L45 AND (L12 OR L30 OR L32 OR L37)
L49          11 SEA L11 OR L13 OR L14 OR L17 OR L31 OR L33 OR L35 OR L36
L50          40 SEA (L16 OR L30 OR L38 OR L39 OR L48) NOT L49
L51          61 SEA (L12 OR L32 OR L47 OR L45) NOT (L49 OR L50)
L52           9 SEA L49 AND (1907-2001/PY OR 1907-2001/PRY)
L53          33 SEA L50 AND (1907-2001/PY OR 1907-2001/PRY)
L54          51 SEA L51 AND (1907-2001/PY OR 1907-2001/PRY)
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=> file hca
FILE 'HCA' ENTERED AT 10:48:52 ON 13 FEB 2004
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L52 ANSWER 1 OF 9 HCA COPYRIGHT 2004 ACS on STN
138:355769 Preparation of **sintered polycrystalline gallium nitride** by hot **isostatic** pressing in **Vycor** glass or hexagonal **BN** containers. D'Evelyn, Mark P.; Pender, David C.; Vagarali, Suresh

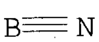
S.; Park, Dong-Sil (USA). U.S. Pat. Appl. Publ. US 2003086856 A1 20030508, 10 pp. (English). CODEN: USXXCO. APPLICATION: US 2001-1575 20011102.

AB **Polycryst. gallium nitride** ( **GaN**) with .apprx.49-55 at.% of gallium, an apparent **d.** of .apprx.5.5-6.1 **g/cm3** and a **Vickers hardness** of .gtorsim.1 **GPa** are fabricated by hot **isostatic** pressing at .apprx.1150-1300° under .apprx.1-10 kbar pressure. Alternatively, **polycryst. GaN** can be made by **high pressure/high temp.** ( **HP/HT**) **sintering** at .apprx.1200-1800° and at a pressure of .apprx.5-80 kbar.

IT **10043-11-5, Boron nitride** (**BN** ), processes
(hexagonal, containers; prepn. of **sintered polycryst. gallium nitride** by hot **isostatic** pressing in **Vycor** glass or hexagonal **BN** containers)

RN 10043-11-5 HCA

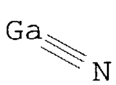
CN Boron nitride (BN) (8CI, 9CI) (CA INDEX NAME)



IT **25617-97-4, Gallium nitride**
(**polycryst.**; prepn. of **sintered polycryst. gallium nitride** by hot **isostatic** pressing in **Vycor** glass or hexagonal **BN** containers)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



IC ICM C01B021-06

NCL 423409000

CC 49-4 (Industrial Inorganic Chemicals)
Section cross-reference(s): 57

ST **polycryst gallium nitride hardness** surface roughness pressing **sintering** electronics

IT **Hardness** (mechanical)
(**Vickers**; prepn. of **sintered polycryst. gallium nitride** by hot **isostatic** pressing in **Vycor** glass or hexagonal

**BN** containers)

IT High-silica glasses
(containers; prepn. of **sintered polycryst. gallium nitride** by hot **isostatic** pressing in **Vycor** glass or hexagonal **BN** containers)

IT **Polycrystalline** materials
(**gallium nitride**; prepn. of **sintered polycryst. gallium nitride** by hot **isostatic** pressing in **Vycor** glass or hexagonal **BN** containers)

IT Containers
(glass, **vycor**; prepn. of **sintered polycryst. gallium nitride** by hot **isostatic** pressing in **Vycor** glass or hexagonal **BN** containers)

IT **Sintering**
(hot **isostatic** pressing; prepn. of **sintered polycryst. gallium nitride** by hot **isostatic** pressing in **Vycor** glass or hexagonal **BN** containers)

IT Grain size
Optoelectronics
Semiconductor devices
Sputtering targets
Surface roughness
(prepn. of **sintered polycryst. gallium nitride** by hot **isostatic** pressing in **Vycor** glass or hexagonal **BN** containers)

IT Molding
(press; prepn. of **sintered polycryst. gallium nitride** by hot **isostatic** pressing in **Vycor** glass or hexagonal **BN** containers)

IT **10043-11-5, Boron nitride** (**BN**), processes
(hexagonal, containers; prepn. of **sintered polycryst. gallium nitride** by hot **isostatic** pressing in **Vycor** glass or hexagonal **BN** containers)

IT **25617-97-4, Gallium nitride**
(**polycryst.**; prepn. of **sintered polycryst. gallium nitride** by hot **isostatic** pressing in **Vycor** glass or hexagonal **BN** containers)

L52 ANSWER 2 OF 9 HCA 

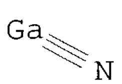
133:186826 Process for the manufacture of Group IIIA nitride targets for use in sputtering and similar equipment. Suscavage, Michael J.; Harris, Meckie T.; Bliss, David F.; Bailey, John S.; Callahan, Michael (The United States of America as Represented by Secretary of the Air Force, USA). U.S. US 6113985 A **20000905**, 5 pp. (English). CODEN: USXXAM. APPLICATION: US 1999-300053 19990427.

AB Using a **GaN** growth furnace, at least three different techniques can be used for forming the targets for the deposition of thin films. In the 1st, nitrides can be deposited as a dense coating on a target backing plate for use as a target. In this approach, the backing plate is placed near the Group III metal. During processing, the Group III metal or metal halide vaporizes and reacts with the N source to deposit a dense **polycryst.** layer on the backing plate. To build up a thick layer on the backing plate, the backing plate is repeatedly placed in the processing furnace until a satisfactory thickness is attained. For the 2nd approach, a properly shaped reaction vessel, the dense, thick Group III nitride crust that forms on top of the Group III metal during the process can be used directly or mech. altered to meet the size requirements for a sputtering target holder. As a 3rd approach, the Group III nitride material can be ground into a fine powder using traditional ceramic powder processing methods and then pressed to consolidate the powder into a sputtering target. The 3rd processing option would typically lead to a low d. target; however, this green compact can then be reinserted into the same processing app. that the original powder was synthesized to infiltrate the open pores with the same or another Group III metal nitride. This would produce a high d., thick target.

IT **25617-97-4P, Gallium nitride**
(process for manuf. of Group IIIA nitride targets for use in sputtering and similar equipment)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



IC ICM C23C016-08

NCL 427255390

CC 76-12 (Electric Phenomena)

IT Grinding (size reduction)
**Polycrystalline** films
**Sintering**
Sputtering targets
(process for manuf. of Group IIIA nitride targets for use in sputtering and similar equipment)

IT 24304-00-5P, Aluminum nitride **25617-97-4P, Gallium**

**nitride** 25617-98-5P, Indium nitride
(process for manuf. of Group IIIA nitride targets for use in sputtering and similar equipment)

L52 ANSWER 3 OF 9 HCA COPYRIGHT 2004 ACS on STN
133:35558 Raman and photoluminescence spectra of indented cubic boron nitride and **polycrystalline** cubic boron nitride. Erasmus, R. M.; Comins, J. D.; Fish, M. L. (Department of Physics, University of the Witwatersrand, Johannesburg, 2050, S. Afr.). Diamond and Related Materials, 9(3-6), 600-604 (English) **2000**. CODEN: DRMTE3. ISSN: 0925-9635. Publisher: Elsevier Science S.A..

AB The use of Raman spectroscopy, and in particular Raman line shifts, to measure stress in diamond and nitrides such as **Ga nitride** (**GaN**), is known. In both diamond and **GaN** the application is principally to study stresses in thin films and at the substrate-thin film interface. Stresses in **polycryst.** diamond composites also were measured by this method. Typically stresses of the order of **GPa** can be detd. with a spatial resoln. of a few micrometers. Raman spectra of indentations on cubic B nitride (cBN) crystals and **polycryst**. cubic B nitride (PcBN) composites are presented. Shifts of the cBN Raman lines from their unstressed positions quantify the residual stresses in the B nitride due to the deformation brought about by the indentation. Making use of the measured coeff. of shift of 3.39 cm-1/**GPa** for the transverse optical Raman peak, these are of the order of 1 **GPa**. These measurements illustrate, for the 1st time, the use of Raman spectroscopy to study residual stresses in B nitride. Plastic deformation is usually assocd. with the creation of vacancies. To study the possible presence of vacancy defects and vacancy-related defects, the indented B nitride samples were also studied with photoluminescence spectroscopy.

CC 73-3 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)

ST Raman spectra luminescence indented cubic **polycryst** boron nitride

IT Crystal vacancies
Luminescence
Plastic deformation
Raman spectra
(Raman and photoluminescence spectra of indented cubic boron nitride and **polycryst.** cubic boron nitride)

IT Stress, mechanical
(residual; Raman and photoluminescence spectra of indented cubic boron nitride and **polycryst.** cubic boron nitride)

IT Optical phonon
(thermal; Raman and photoluminescence spectra of indented cubic boron nitride and **polycryst.** cubic boron nitride)

IT 10043-11-5, Boron nitride bn, properties
(cubic; Raman and photoluminescence spectra of indented cubic boron nitride and **polycryst.** cubic boron nitride)

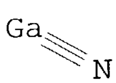
L52 ANSWER 4 OF 9 HCA COPYRIGHT 2004 ACS on STN
132:115756 **GaN** thin film deposited by reactive ion cluster beam deposition RICBD technique. Huang, Hao; Meng, Xiang-quan; Wang, Qiong; Guo, Huai-xi; Fan, Xiang-jun (Department of PHysics, Wuhan University, Wuhan, 430072, Peop. Rep. China). Wuhan Daxue Xuebao, Ziran Kexueban, 45(5A), 604-606 (Chinese) **1999**. CODEN: WTHPDI. ISSN: 0253-9888. Publisher: Wuhan Daxue Xuebao Bianjibu.

AB According the basic theory of ionized cluster beam, **GaN** thin films was deposited by reactive ionized cluster beam technique at the substrate temp. of .apprx.400°. The measurements of TEM and SEM reveal that this film is a **polycrystalloid.** The compn. of the film is measured by XPS. The result proves the existence of Ga-N bonding. The measurement confirms that **at . ratio** of Ga and N in the film is .apprx.1:1. There is a little amt. of Ga2O3 in the film. It is proved by the comparison between two expts. that increasing nitrogen ions ration in the beam can decrease Ga2O3. On the summer, the RICBD is a hopeful way to prep. **GaN** at low substrate temp. and at fairly depositing rate.

IT **25617-97-4P, Gallium nitride (GaN)**
(**GaN** thin film deposited by reactive ion cluster beam deposition RICBD technique)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)




CC 76-3 (Electric Phenomena)
Section cross-reference(s): 75

ST **gallium nitride** reactive ion cluster beam deposition

IT Ion beams
Scanning electron microscopy
Semiconductor materials
Transmission electron microscopy
(**GaN** thin film deposited by reactive ion cluster beam deposition RICBD technique)

IT Vapor deposition process
(chem., reactive ion cluster beam; **GaN** thin film deposited by reactive ion cluster beam deposition RICBD

technique)

IT **25617-97-4P**, **Gallium nitride** (
**GaN**)
(**GaN** thin film deposited by reactive ion cluster beam deposition RICBD technique)

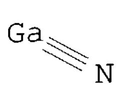
L52 ANSWER 5 OF 9 HCA COPYRIGHT 2004 ACS on STN
132:17285 Growth of oriented thick films of **gallium nitride** from the melt. Dyck, Jeffrey S.; Kash, Kathleen; Grossner, Michael T.; Hayman, Cliff C.; Argoitia, Alberto; Yang, Nan; Hong, Moon-Hi; Kordesch, Martin E.; Angus, John C. (Dept. of Physics, Case Western Reserve University, Cleveland, OH, 44106, USA). Materials Research Society Symposium Proceedings, 537(GaN and Related Alloys), G3.23/1-G3.23/6 (English) **1999**. CODEN: MRSPDH. ISSN: 0272-9172. Publisher: Materials Research Society.

AB While significant strides were made in the optimization of **GaN**-based devices on foreign substrates, a more attractive alternative would be homoepitaxy on **GaN** substrates. The primary motivation of this work is to explore the growth of thick films of **GaN** from the melt for the ultimate use as substrate material. The authors have previously demonstrated the synthesis of **polycryst.**, wurtzitic **GaN** and InN by satg. Ga metal and In metal with at. N from a microwave plasma source. Plasma synthesis avoids the **high** equil. **pressures** required when $N_2$ was used as the N source. Here the authors report the growth of thick oriented **GaN** layers using the same technique by the introduction of (0001) sapphire into the melt to serve as a substrate. The mechanism of this growth is not established, but may involve transport of the metal as a liq. film onto the sapphire and subsequent reaction with at. N. The films were characterized by x-ray diffraction, SEM, TEM, and Raman spectroscopy. X-ray diffraction showed that the **GaN** films were oriented with their c-axes parallel to the sapphire c-axis. The TEM anal. confirmed the orientation and revealed a dislocation **d.** of .apprx.1010 cm-2. The E2 Raman active phonon modes were obsd. in the **GaN** films.

IT **25617-97-4**, **Gallium nitride** (**GaN**
)
(growth of oriented thick films of **gallium nitride** on (0001) sapphire from melt by epitaxy for ultimate use as substrate material)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 75-1 (Crystallography and Liquid Crystals)
ST growth oriented thick film **gallium nitride** melt
IT Crystal dislocations
(dislocation **d.** in **gallium nitride** thick films on sapphire (0001) substrates)
IT Liquid phase epitaxy
(growth of oriented thick films of **gallium nitride** on (0001) sapphire from melt by epitaxy for ultimate use as substrate material)
IT Crystal orientation
(of **gallium nitride** thick films on sapphire (0001) substrates)
IT **25617-97-4, Gallium nitride** (**GaN**)
(growth of oriented thick films of **gallium nitride** on (0001) sapphire from melt by epitaxy for ultimate use as substrate material)

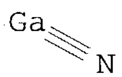
L52 ANSWER 6 OF 9 HCA 
131:293416 Growth of oriented thick films of **gallium nitride** from the melt. Dyck, Jeffrey S.; Kash, Kathleen; Grossner, Michael T.; Hayman, Cliff C.; Argoitia, Alberto; Yang, Nan; Hong, Moon-Hi; Kordesch, Martin E.; Angus, John C. (Dept. of Physics, Case Western Reserve University, Cleveland, OH, 44106, USA). MRS Internet Journal of Nitride Semiconductor Research [Electronic Publication], 4S1, No pp. Given (English) **1999**. CODEN: MIJNF7. ISSN: 1092-5783. URL: http://nsr.mij.mrs.org/4S1/G3.23/article.pdf Publisher: Materials Research Society.
AB While significant strides have been made in the optimization of **GaN**-based devices on foreign substrates, a more attractive alternative would be homoepitaxy on **GaN** substrates. The primary motivation of this work is to explore the growth of thick films of **GaN** from the melt for the ultimate use as substrate material. The synthesis of **polycryst.**, wurtzitic **Ga nitride** and In nitride by satg. Ga metal and In metal with at. N from a microwave plasma source has been previously demonstrated. Plasma synthesis avoids the **high** equil. **pressures** required when N2 is used as the N source. Here thick oriented **GaN** layers were grown using the same technique by the introduction of (0001) sapphire into the melt to serve as a substrate. The mechanism of this growth is not established, but may involve transport of the metal as a liq. film onto the sapphire and subsequent reaction with at. N. The films were characterized by x-ray diffraction, SEM, TEM, and Raman spectroscopy. X-ray diffraction showed that the **GaN** films were oriented with their c-axes parallel to the sapphire c-axis. The TEM anal. confirmed the orientation and revealed a dislocation

**d.** of .apprx.1010 cm-2. The E2 Raman active phonon modes were obsd. in the **GaN** films.

IT **25617-97-4, Gallium nitride**
(growth of oriented thick films of **gallium nitride** from melt and characterization)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 75-1 (Crystallography and Liquid Crystals)

ST **gallium nitride** oriented film growth melt sapphire

IT Liquid phase epitaxy
(growth of oriented thick films of **gallium nitride** from melt on sapphire)

IT Crystal dislocations
(in oriented thick films of **gallium nitride** grown from melt on sapphire)

IT Raman spectra
(of oriented thick films of **gallium nitride** grown from melt on sapphire)

IT **25617-97-4, Gallium nitride**
(growth of oriented thick films of **gallium nitride** from melt and characterization)

L52 ANSWER 7 OF 9 HCA COPYRIGHT 2004 ACS on STN

124:67593 Hydrogen desorption and ammonia adsorption on **polycrystalline GaN** surfaces. Chiang, C.-M.; Gates, S. M.; Bensaoula, A.; Schultz, J. A. (IBM T.J. Watson Research Center, Yorktown Heights, NY, 10598, USA). Chemical Physics Letters, 246(3), 275-8 (English) **1995.** CODEN: CHPLBC. ISSN: 0009-2614. Publisher: Elsevier.

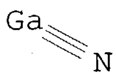
AB We have studied the D2 desorption and NH3 adsorption on **polycryst. GaN** surfaces using time-of-flight detection of recoiled H+ and **D**+ ions. Two surface deuterium states characterized by different thermal stability are identified. Rate anal. for isothermal D2 desorption is performed near 250°C, which we attribute to desorption from Ga sites. We assign the **higher temp.** D2 desorption state decompg. near 500°C to desorption from N sites. Both clean and **D**-terminated **GaN** surfaces are quite reactive towards NH3 adsorption. We obsd. that H/**D** exchange during NH3 exposure occurs rapidly at room temp.

IT **25617-97-4, Gallium nitride (GaN**
)

(adsorption of ammonia and desorption of hydrogen from **polycryst. GaN** surfaces)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 66-3 (Surface Chemistry and Colloids)
Section cross-reference(s): 73

ST hydrogen desorption ammonia adsorption **gallium nitride**

IT Adsorption
(of ammonia on **polycryst. GaN** surfaces)

IT Desorption
(of hydrogen from **polycryst. GaN** surfaces)

IT Adsorbed substances
(thermal stability-differing surfaces states of adsorbed $D_2$ on **GaN**)

IT 7664-41-7, Ammonia, processes
(adsorption of $NH_3$ on **polycryst. GaN** surfaces)

IT **25617-97-4, Gallium nitride** (**GaN** )
(adsorption of ammonia and desorption of hydrogen from **polycryst. GaN** surfaces)

IT 1333-74-0, Hydrogen, processes
(desorption of $D_2$ from **polycryst. GaN** surfaces)

IT 7782-39-0, Deuterium, properties
(thermal stability-differing surfaces states of adsorbed $D_2$ on **GaN**)

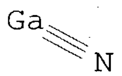
L52 ANSWER 8 OF 9 HCA COPYRIGHT 2004 ACS on STN

111:162794 Semiconductor radiation detector. Ootsuchi, Tetsuo; Oomori, Yasuichi; Tsutsui, Hiroshi; Baba, Matsuki; Watanabe, Masanori (Matsushita Electric Industrial Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 01089471 A2 **19890403** Heisei, 4 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1987-246445 19870930.

AB A semiconductor radiation detector, **sintered** for use in counters, radiog. app., and nondestructive testing app., comprises $\geq$1 heterojunctions of a radiation-sensitive semiconductor crystal and a single (micro, **poly**)**cryst.** thin film having a bandgap greater than the semiconductor crystal and a thickness of 0.01-10 μm.

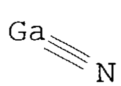
IT **25617-97-4, Gallium nitride** (**GaN** )

(thin-film, radiation detector contg. semiconductor crystal and)
RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)

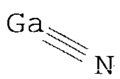


IC ICM H01L031-00
ICS G01T001-24
CC 71-7 (Nuclear Technology)
Section cross-reference(s): 76
IT 1315-09-9, Zinc selenide **25617-97-4, Gallium nitride (GaN)** 1303-11-3, Indium arsenide, uses and miscellaneous
(thin-film, radiation detector contg. semiconductor crystal and)

L52 ANSWER 9 OF 9 HCA COPYRIGHT 2004 ACS on STN
95:213766 Growth of aluminum **gallium nitride** thin films for electro-optic device applications. Smith, Donald L.; Bruce, Richard H. (Perkin-Elmer Corp., Norwalk, CT, USA). Report, PE-28935; Order No. AD-A099517, 44 pp. Avail. NTIS From: Gov. Rep. Announce. Index (U. S.) 1981, 81(20), 4396 (English) **1981**.
AB **GaN** was deposited on sapphire by reaction of Ga with a **high-pressure** (100 Pa) N2 plasma over the substrate. **High** plasma **pressure** and low substrate temp. were used to inhibit N-vacancy formation. Be, a likely and low-volatility p-dopant, was codeposited. After it proved impractical to introduce Ga into the N2 plasma by evapn., it was sputtered in a 100 Pa **d.c.** N2 plasma with much better success. Epitaxy of undoped films was obtained at 700°, although films doped to 4-6 + 1020 Be/cm3 were **polycryst.** All films were n-type and exhibited a large activation energy for conduction, indicating the dominance of unintentional deep impurities. Undoped films had resistivities of 4 + 105 Ω-cm at 300° and 20,000 Ω-cm at 600°. Be dopant increased cond. by 100 and appeared to be acting as a deep donor. A cleaner sputtering environment and closer Be control are recommended in the further pursuit of p-type **GaN.**
IT **25617-97-4D,** solid solns. with aluminum nitride
(film deposition of p-doped)
RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



IT **25617-97-4**
(sputtering of beryllium-doped films of)
RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 76-4 (Electric Phenomena)
ST aluminum **gallium nitride** film deposition;
**gallium nitride** film sputtering; beryllium doped
**gallium nitride** film
IT Sputtering
(of **gallium nitride** beryllium-doped films)
IT 24304-00-5D, solid solns. with **gallium nitride**
**25617-97-4D**, solid solns. with aluminum nitride
(film deposition of p-doped)
IT **25617-97-4**
(sputtering of beryllium-doped films of)
IT 7440-41-7, properties
(sputtering of **gallium nitride** films doped
with)

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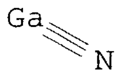
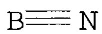
L53 ANSWER 1 OF 33 HCA 
137:117972 Fabrication of an electronic device with composite substrate.
Kub, Francis J.; Hobart, Karl D. (USA). U.S. Pat. Appl. Publ. US
2002096106 A1 20020725, 10 pp. (English). CODEN: USXXCO.
APPLICATION: US 2001-764349 20010119.
AB This invention pertains to an electronic device contg. a composite substrate which is a multilayer of which at least one layer is **polycryst.**, and to a method for making same. The method for making a multilayered electronic device with at least one epitaxial layer grown on a single-crystal film bonded to a composite in which at least one layer is **polycryst.**, the method includes the step of bonding a single-crystal film at least one of the epitaxial layers on the single-crystal film in which thermal coeffs. of expansion for the substrate and the epitaxial layer are closely matched.
IT **25617-97-4, Gallium nitride** (**GaN**
)
(single crystal film; fabrication of electronic device with
composite substrate)
RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



IT **10043-11-5, Boron nitride,** uses
(substrate; fabrication of electronic device with composite substrate)
RN 10043-11-5 HCA
CN Boron nitride (BN) (8CI, 9CI) (CA INDEX NAME)

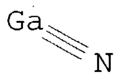


IC ICM C30B025-00
ICS C30B023-00; C30B028-12; C30B028-14
NCL 117094000
CC 76-3 (Electric Phenomena)
Section cross-reference(s): 75
IT 409-21-2, Silicon carbide (SiC), uses 1303-00-0, Gallium arsenide, uses 1303-11-3, Indium arsenide (InAs), uses 1309-48-4, Magnesium oxide (MgO), uses 7440-21-3, Silicon, uses 7789-75-5, Calcium fluoride (CaF2), uses 11148-21-3 12064-03-8, Gallium antimonide 22398-80-7, Indium phosphide, uses **25617-97-4, Gallium nitride (GaN)** 106097-44-3, Aluminum **gallium nitride** (AlGaN) 120994-23-2, Gallium indium nitride (GaInN)
(single crystal film; fabrication of electronic device with composite substrate)
IT 7782-40-3, Diamond, uses 7782-42-5, Graphite, uses
**10043-11-5, Boron nitride,** uses
24304-00-5, Aluminum nitride (AlN)
(substrate; fabrication of electronic device with composite substrate)

L53 ANSWER 2 OF 33 HCA COPYRIGHT 2004 ACS on STN
137:86616 Surface preparation procedures for contacting **GaN.**
Moldovan, Grigore; Marlafeka, Spyridoula; Harrison, Ian; Brown, Paul D. (Sch. of Mech., Mater., Manufg. Eng. and Manage., Univ. of Nottingham, Univ. Park, Nottingham, NG7 2RD, UK). Institute of Physics Conference Series, 168(Electron Microscopy and Analysis), 357-360 (English) **2001.** CODEN: IPCSEP. ISSN: 0951-3248. Publisher: Institute of Physics Publishing.
AB Changes to MBE grown **GaN** surfaces produced by SiCl4 reactive ion etching are investigated. Surface morphol. is found not to change greatly, but surface **roughness** slowly increases for increasing plasma power with a strong dependence on

the chamber pressure. A change in etching mechanism from chem. to a phys. dominated process occurs under conditions of high plasma power and **high** chamber **pressure.** RHED demonstrates that a remnant oxide/**polycryst.** layer from the growth is effectively removed by the SiCl4 etching process.

IT **25617-97-4, Gallium nitride**
(surface prepn. procedures for contacting **GaN**)
RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 76-3 (Electric Phenomena)
Section cross-reference(s): 66
ST **gallium nitride** reactive ion etching surface **roughness**
IT Sputtering
(etching, reactive; surface prepn. procedures for contacting **GaN**)
IT Etching
(sputter, reactive; surface prepn. procedures for contacting **GaN**)
IT Epitaxial films
Etching kinetics
Surface **roughness**
Surface structure
(surface prepn. procedures for contacting **GaN**)
IT 10026-04-7, Silicon tetrachloride
(etchant; surface prepn. procedures for contacting **GaN**)
IT 1344-28-1, Alumina, processes
(substrate; surface prepn. procedures for contacting **GaN**)
IT **25617-97-4, Gallium nitride**
(surface prepn. procedures for contacting **GaN**)

L53 ANSWER 3 OF 33 HCA COPYRIGHT 2004 ACS on STN
137:26366 Methods and apparatus for producing MIIIN based materials. Cuomo, Jerome J.; Williams, N. Mark; Carlson, Eric P.; Hanser, Andrew D.; Thomas, Darin T. (North Carolina State University, USA). PCT Int. Appl. WO 2002044443 A1 20020606, 69 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF,

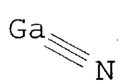
BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2001-US44930 20011130. PRIORITY: US 2000-PV250337 20001130; US 2000-PV250297 20001130.

AB A high deposition rate sputter method is used to produce bulk, single-crystal, low-defect **d.** Group III nitride materials suitable for microelectronic and optoelectronic devices and as substrates for subsequent epitaxy, and to produce highly oriented **polycryst.** windows. A template material having an epitaxial-initiating growth surface is provided. A Group III metal target is sputtered in a plasma-enhanced environment using a sputtering app. comprising a nonthermionic electron/plasma injector assembly, thereby to producing a Group III metal source vapor. The Group III metal source vapor is combined with a nitrogen-contg. gas to produce a reactant vapor species comprising Group III metal and nitrogen. The reactant vapor species is deposited on the growth surface to produce a single-crystal MIII layer thereon. The template material is removed, thereby providing a free-standing, single-crystal MIIIN article having a diam. of .apprx.0.5 in or greater and a thickness of .apprx.50 $\mu$ or greater.

IT **25617-97-4, Gallium nitride**
(template, intermediate layer, and windows; method for producing MIIIN article comprising step of depositing intermediate layer on template and method for producing highly oriented **polycryst.** windows of MIIIN)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



IC ICM C30B023-08
ICS C30B023-02; C30B025-06; C30B029-38

CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 73

ST Group III nitride prodn sputter transport device; **polycryst** window Group III nitride

IT Windows
(IR; method for producing highly oriented **polycryst.** windows of MIIIN)

IT **Polycrystalline** materials
(method for producing highly oriented **polycryst.** windows of MIIIN)

IT Windows
(microwave; method for producing highly oriented **polycryst.** windows of MIIIN)

IT 24304-00-5, Aluminum nitride (AlN)

(intermediate layer and windows; method for producing MIIIN article comprising step of depositing intermediate layer on template and method for producing highly oriented **polycryst.** windows of MIIIN)

IT 7664-41-7, Ammonia, processes 7727-37-9D, Nitrogen, compds. 17778-88-0, **Atomic** nitrogen, processes
(nitrogen source; method for producing MIIIN article)

IT **25617-97-4, Gallium nitride**
(template, intermediate layer, and windows; method for producing MIIIN article comprising step of depositing intermediate layer on template and method for producing highly oriented **polycryst.** windows of MIIIN)

L53 ANSWER 4 OF 33 HCA COPYRIGHT 2004 ACS on STN

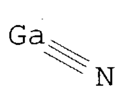
135:160894 Properties of **GaN** films deposited on Si(111) by radio-frequency-magnetron sputtering. Miyazaki, Takayuki; Fujimaki, Tamotsu; Adachi, Sadao; Ohtsuka, Kohji (Faculty of Engineering, Department of Electronic Engineering, Gunma University, Kiryu-shi, Gunma, 376-8515, Japan). Journal of Applied Physics, 89(12), 8316-8320 (English) **2001**. CODEN: JAPIAU. ISSN: 0021-8979. Publisher: American Institute of Physics.

AB **GaN** films have been deposited on Si(111) substrates by reactive rf-magnetron sputtering at nitrogen pressures from 0.08 to 2.70 Pa without intentionally heating the substrates. X-ray diffraction (XRD), spectroscopic ellipsometry (SE), and ex situ **at.**-force microscopy (AFM) observations have been carried out. The XRD patterns indicate that the **GaN** films deposited at pressures lower than 1.10 Pa are **polycryst.** films highly oriented with the (0001) plane preferred, while those deposited at ≥1.10 Pa display mixed orientations or amorphous form. The pseudodielec. function $\varepsilon$(E)=$\varepsilon$1(E)+i.epsil on.2(E) of the sputter-deposited **GaN** films has been measured by SE in the range between 1.50 and 5.00 eV at room temp. The measured $\varepsilon$(E) spectra are analyzed by taking into account the effects of surface **roughness** based on an effective medium model. The **roughness** thickness for the film deposited at 0.27 Pa is detd. to be .apprx.17 Å, which is comparable to the AFM rms value (.apprx.11 Å).

IT **25617-97-4, Gallium nitride** (**GaN**
)
(properties of **GaN** films deposited on Si(111) by radio-frequency-magnetron sputtering)

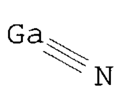
RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



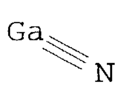
CC 76-12 (Electric Phenomena)
ST **gallium nitride** film deposited silicon radio frequency magnetron sputtering
IT **Atomic** force microscopy
Dielectric function
Ellipsometry
Surface **roughness**
Thickness
(properties of **GaN** films deposited on Si(111) by radio-frequency-magnetron sputtering)
IT Magnetron sputtering
(radio-frequency; properties of **GaN** films deposited on Si(111) by radio-frequency-magnetron sputtering)
IT 7440-21-3, Silicon, uses
(properties of **GaN** films deposited on Si(111) by radio-frequency-magnetron sputtering)
IT **25617-97-4, Gallium nitride** (**GaN**
)
(properties of **GaN** films deposited on Si(111) by radio-frequency-magnetron sputtering)
IT 7440-55-3, Gallium, reactions 7727-37-9, Nitrogen, reactions
(properties of **GaN** films deposited on Si(111) by radio-frequency-magnetron sputtering)

L53 ANSWER 5 OF 33 HCA COPYRIGHT 2004 ACS on STN
135:68828 Growth of epitaxial semiconductor layers on highly lattice mismatched substrates. Wang, Wang Nang; Shreter, Yurii Georgievich; Rebane, Yurii Toomasovich; Yavich, Boris Samuilovich; Bougrov, Vladislav Evgenievich (Arima Optoelectronics Corp., Taiwan). Brit. UK Pat. Appl. GB 2350721 A1 **20001206**, 12 pp. (English). CODEN: BAXXDU. APPLICATION: GB 1999-20048 19990824.
AB A method of growing a Group III-nitride semiconductor layer on a lattice mismatched substrate comprises depositing an amorphous or **polycryst.** buffer layer of BxAlyGazIn1-x-y-zN alloy on the substrate and recrystg. the buffer layer before epitaxially growing the semiconductor layer. The substrate may comprise sapphire and the semiconductor layer may be **GaN.**
IT **25617-97-4, Gallium nitride**
(growth of epitaxial semiconductor layers on highly lattice mismatched substrates)
RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



IC ICM H01L021-20
CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 76
IT Epitaxy
**Polycrystalline** materials
Semiconductor materials
(growth of epitaxial semiconductor layers on highly lattice mismatched substrates)
IT 39318-21-3, Aluminum **boron nitride** 39466-99-4,
Boron **gallium nitride** 279221-83-9, Boron
indium nitride ((B,In)N)
(buffer layer; growth of epitaxial semiconductor layers on highly lattice mismatched substrates)
IT **25617-97-4, Gallium nitride**
189323-36-2, Boron **gallium nitride** (B0.1Ga0.9N)
(growth of epitaxial semiconductor layers on highly lattice mismatched substrates)

L53 ANSWER 6 OF 33 HCA COPYRIGHT 2004 ACS on STN
134:259901 Breakdown of **gallium nitride** by ions and
low energy electrons. Elovikov, S. S.; Gvozdover, R. S.; Zykova, E. Yu.; Mosunov, A. S.; Yurasova, V. E. (Mosk. Gos. Univ., Moscow, Russia). Poverkhnost (12), 34-38 (Russian) **2000.** CODEN: PFKMDJ. ISSN: 0207-3528. Publisher: Nauka.
AB Sputtering features and mechanisms of **gallium nitride** (**GaN**) **polycrystal** with wurtzite structure were investigated exptl. and by means of computer simulation. The abs. value of sputtering yield of **GaN** was measured. The comparative anal. of data for nitrides with different relation of mass components (**BN**, AlN, **GaN**) and binding energies was made. The radiation stability of **GaN** **polycrystal** to electrons for bulk and thin film specimens was studied. It was shown that the desorption of nitrogen under low energy electron irradn. takes place and this process is more effective for the case of thin films.
IT **25617-97-4, Gallium nitride**
(breakdown of **gallium nitride** by ions and low energy electrons)
RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



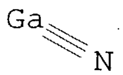

CC 76-13 (Electric Phenomena)
Section cross-reference(s): 74
ST **gallium nitride** electron ion sputtering decompn

IT Desorption
Electron beams
Radiolysis
Semiconductor films
Sputtering
(breakdown of **gallium nitride** by ions and low energy electrons)
IT 7727-37-9, Nitrogen, processes
(breakdown of **gallium nitride** by ions and low energy electrons)
IT 14791-69-6, Argon 1+, processes
(breakdown of **gallium nitride** by ions and low energy electrons)
IT **25617-97-4, Gallium nitride**
(breakdown of **gallium nitride** by ions and low energy electrons)


133:158128 Gas source MBE-grown **GaN**-related novel semiconductors for novel device applications. Asahi, H.; Tampo, H.; Hiroki, H.; Imanishi, Y.; Asami, K.; Gonda, S. (Osaka University, Osaka, 567-0047, Japan). Memoirs of the Institute of Scientific and Industrial Research, Osaka University, 57(Third SANKEN International Symposium, 2000), 34-41 (English) **2000**. CODEN: MISIAW. ISSN: 0369-0369. Publisher: Osaka University, Institute of Scientific and Industrial Research.

AB **Polycryst. GaN** and **GaN**-rich GaNP films were grown by gas source MBE on SiO2 and Al2O3 substrates, resp., and they were characterized by XRD and photoluminescence (PL) spectra as a function of the concn. of P and the growth conditions. With increasing P concn., the band gap energy was shifted to lower energies. For the **GaN**-rich GaNP films, the same band gap energy was obtained with only a small lattice mismatch to **GaN** as for the conventionally used InGaN. The GaNP layers, therefore, are suitable as active layers in laser diodes. For the **polycryst. GaN** samples, the PL intensity was comparable to that of a Si-doped single cryst. **GaN** grown on Al2O3 by MOVPE at Nichia Chem. Industries. For the 1st time, p-type doping was achieved using Be as the dopant. This result, together with the optical properties, makes the **polycryst. GaN** on SiO2 substrates a suitable candidate for the fabrication of large-area and low-cost photonic devices.

IT **25617-97-4, Gallium nitride**
(structural, elec., and optical characteristics of gas source MBE-grown **GaN**-related novel semiconductors for novel device applications)
RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 76-2 (Electric Phenomena)
Section cross-reference(s): 75
ST **gallium nitride** phosphide film MBE photoluminescence elec property; p type doping beryllium **gallium nitride** film MBE photoluminescence
IT Crystallinity
Electron **density**
Hole concentration
Luminescence
Molecular beam epitaxy
(structural, elec., and optical characteristics of gas source MBE-grown **GaN**-related novel semiconductors for novel device applications)
IT 7803-51-2, Phosphine
(PH3 flow rate dependence on P compn. of gas source MBE-grown **GaN**-rich GaNP semiconductors)
IT 7440-21-3, Silicon, uses 7440-41-7, Beryllium, uses
(dopant; structural, elec., and optical characteristics of gas source MBE-grown **GaN**-related novel semiconductors for novel device applications)
IT **25617-97-4, Gallium nitride**
114868-38-1, **Gallium nitride** phosphide (GaN0.98P0.02) 166987-30-0, **Gallium nitride** phosphide (GaN0.99P0.01)
(structural, elec., and optical characteristics of gas source MBE-grown **GaN**-related novel semiconductors for novel device applications)
IT 1344-28-1, Alumina, uses 7631-86-9, Silica, uses 60676-86-0, Vitreous silica
(substrate; structural, elec., and optical characteristics of gas source MBE-grown **GaN**-related novel semiconductors for novel device applications)

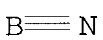
L53 ANSWER 8 OF 33 HCA COPYRIGHT 2004 ACS on STN
133:155714 Modelling hydrogen in the group-III nitrides by its pseudo-isotope, muonium. Cox, S. F. J.; King, P. J. C.; Williams, W. G.; Chow, K. H.; Jestadt, T.; Hayes, W.; Lichti, R. L.; Schwab, C. R.; Davis, E. A. (ISIS Facility, Rutherford Appleton Laboratory, Chilton, Oxfordshire, OX11 0QX, UK). Physica B: Condensed Matter (Amsterdam), 289&290, 538-541 (English) **2000.** CODEN: PHYBE3. ISSN: 0921-4526. Publisher: Elsevier Science B.V..
AB Muon and muonium states in the wide-bandgap semiconductors **BN**, AlN, and **GaN** are characterized by various

types of μSR measurement on **polycryst.** samples. The muonium fractions range from 80 % in hexagonal **BN** to zero in **GaN**. The hyperfine consts. estd. from repolarization curves are 80 % of the free muonium value in **BN** and 95 % in AlN, with superhyperfine interactions to the host nuclei is evident. The electronically diamagnetic states show strong level-crossing resonances in AlN and **GaN** (although none is detectable in **BN**). These have the signature of cross-relaxation to 14N in AlN and to 69Ga and 71Ga in **GaN**, suggesting that the diamagnetic states are Mu+ and Mu- in these naturally p- and n-type materials, resp. Mu- diffusion in **GaN** sets is only above 600 K, with an activation energy of 1 eV.

IT **10043-11-5, Boron nitride** (**BN**), properties **25617-97-4, Gallium nitride** (**GaN**)
(study of group-III nitrides by its muonium spin resonance)

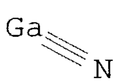
RN 10043-11-5 HCA

CN Boron nitride (BN) (8CI, 9CI) (CA INDEX NAME)



RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 65-4 (General Physical Chemistry)
Section cross-reference(s): 69

ST muonium ion diffusion boron aluminum **gallium nitride** spin resonance

IT Activation energy
(activation energy of Mu- diffusion in **GaN**)

IT Diffusion
(ionic; Mu- diffusion in **GaN**)

IT Semiconductor materials
(**polycryst.**; study of group-III nitrides by its muonium spin resonance)

IT **10043-11-5, Boron nitride** (**BN**), properties 12587-65-4, Muonium 24304-00-5, Aluminum nitride AlN **25617-97-4, Gallium nitride** (**GaN**)
(study of group-III nitrides by its muonium spin resonance)

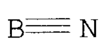
L53 ANSWER 9 OF 33 HCA 

133:128449 Features of sputtering of nitrides with various component mass ratios. Promokhov, A. A.; Mosunov, A. S.; Elovikov, S. S.; Yurasova, V. E. (Moscow Lomonosov State University, Moscow, 117234, Russia). Vacuum, 56(4), 247-252 (English) **2000**. CODEN: VACUAV. ISSN: 0042-207X. Publisher: Elsevier Science Ltd..

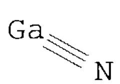
AB Sputtering of single and **polycrystals** of three nitrides **BN**, AlN and **GaN** of wurzite structure by Ar ions with energy E0 = 0.3-10 keV was computer simulated by the mol. dynamics method. The total yields are inversely proportional to the binding energies for **polycrystals** for E0 > 2 keV. Under normal ion incidence ($\alpha$ 0.), preferential sputtering of the light component of nitrides increases with component mass difference, esp. for low E0. The fraction of the light component is lower for $\alpha$ 45. than for $\alpha$ 0., particularly for small E0. Spatial distribution anisotropy from single crystals is most pronounced for the sputtering of 2nd-layer atoms when the 1st layer consists of the lighter atoms, and is low for both components when the 1st layer consists of the heavier atoms. The no. of atoms in collision sequences leading to ejection was found.

IT **10043-11-5, Boron nitride (BN**
), properties **25617-97-4, Gallium nitride (GaN)**
(features of sputtering of Group IIIA nitride single and **polycrystals** with various component mass ratios)

RN 10043-11-5 HCA
CN Boron nitride (BN) (8CI, 9CI) (CA INDEX NAME)



RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 76-11 (Electric Phenomena)
Section cross-reference(s): 75

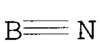
IT Sputtering
Vapor phase epitaxy
(features of sputtering of Group IIIA nitride single and **polycrystals** with various component mass ratios)

IT Group IIIA element nitrides
(features of sputtering of Group IIIA nitride single and **polycrystals** with various component mass ratios)

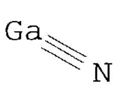
IT **10043-11-5, Boron nitride (BN**
), properties 24304-00-5, Aluminum nitride (AlN)

**25617-97-4, Gallium nitride** (**GaN**
)
(features of sputtering of Group IIIA nitride single and **polycrystals** with various component mass ratios)

L53 ANSWER 10 OF 33 HCA COPYRIGHT 2004 ACS on STN
133:96965 Growth of nitride crystals, **BN**, AlN and **GaN** by using a Na flux. Yano, M.; Okamoto, M.; Yap, Y. K.; Yoshimura, M.; Mori, Y.; Sasaki, T. (Department of Electrical Engineering, Osaka University, Suita, Osaka, 565-0871, Japan). Diamond and Related Materials, 9(3-6), 512-515 (English) **2000**. CODEN: DRMTE3. ISSN: 0925-9635. Publisher: Elsevier Science S.A..
AB Bulk crystals of **BN**, AlN and **GaN** were grown by Na flux. All these crystals were grown at a temp. of 800° and a N pressure of 100 atm, relatively lower than that required by many flux and melt growth methods. High-quality **GaN** single crystals as large as 0.5 mm were obtained. Also, oriented **GaN** crystals were obtained by the seeded Na flux method with the addn. of oriented AlN (0001) film in the growth ambient. The nucleation of bulk **GaN** was spatially confined on top of the AlN film and grown with the **GaN** [0001] axis parallel to the AlN [0001] axis. The h-**BN polycrystals** were confirmed by the h-**BN** (0002) peak of XRD at 2Θ = 26.700. A hexagonal grain with a size as large as 2 μm was obsd. by SEM. Likewise, AlN crystals were also obtained from Al wires.
IT **10043-11-5, Boron nitride** (**BN**
), processes **25617-97-4, Gallium nitride**
(**GaN**)
(crystal growth using sodium flux)
RN 10043-11-5 HCA
CN Boron nitride (BN) (8CI, 9CI) (CA INDEX NAME)



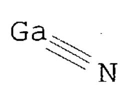
RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 75-1 (Crystallography and Liquid Crystals)
IT Crystallization
(of aluminum nitride and hexagonal **boron nitride** using sodium flux)
IT Crystal growth

(of **gallium nitride** using sodium flux)
IT **10043-11-5, Boron nitride** (**BN**
), processes 24304-00-5, Aluminum nitride (AlN) **25617-97-4**
, **Gallium nitride** (**GaN**)
(crystal growth using sodium flux)
IT 7440-23-5, Sodium, processes
(growth of aluminum, boron and **gallium nitride**
crystals using flux of)

L53 ANSWER 11 OF 33 HCA COPYRIGHT 2004 ACS on STN
132:188316 Morphological and optical characterization of **GaN**
prepared by pulsed laser deposition. Vinegoni, C.; Cazzanelli, M.;
Trivelli, A.; Mariotto, G.; Castro, J.; Lunney, J. G.; Levy, J.
(Department of Physics and Astronomy, University of Pittsburgh,
Pittsburgh, PA, USA). Surface and Coatings Technology, 124(2-3),
272-277 (English) **2000**. CODEN: SCTEEJ. ISSN: 0257-8972.
Publisher: Elsevier Science S.A..
AB **GaN** films were grown by pulsed laser deposition (PLD) on different cryst. substrates using a KrF excimer laser to ablate a hexagonal phase **GaN** target in a reactive atm. of ammonia. Films with small homogeneously distributed granular structures over the entire sample surface were obtained. The microstructure and surface morphol. of the deposited layers were characterized by X-ray diffraction (XRD), **at.** force microscopy (AFM) and Raman spectroscopy (RS). XRD reveals that the structure of the **GaN** layer is predominantly wurtzite. AFM images reveal that all the deposited layers have a relatively **smooth** surface, while RS confirmed the predominant presence of hexagonal **GaN** with a high **polycryst.** character. Anal. of the results obtained for samples grown under different conditions, such as the substrate temps. in the growth chamber as well as different substrates used, helps to define better the exptl. conditions of the growth process of PLD-**GaN** films.
IT **25617-97-4, Gallium nitride**
(morphol. and optical characterization of **GaN** prepd. by
pulsed laser deposition)
RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 76-3 (Electric Phenomena)
Section cross-reference(s): 73
ST **gallium nitride** pulsed laser deposition film
morphol
IT Vapor deposition process

(laser ablation, pulsed-laser; morphol. and optical characterization of **GaN** prepd. by pulsed laser deposition)

IT Microstructure
Semiconductor films
Surface structure
Thickness
(morphol. and optical characterization of **GaN** prepd. by pulsed laser deposition)

IT 7664-41-7, Ammonia, processes
(morphol. and optical characterization of **GaN** prepd. by pulsed laser deposition)

IT **25617-97-4, Gallium nitride**
(morphol. and optical characterization of **GaN** prepd. by pulsed laser deposition)

IT 1317-82-4, Sapphire 7440-21-3, Silicon, processes
(morphol. and optical characterization of **GaN** prepd. by pulsed laser deposition)

L53 ANSWER 12 OF 33 HCA COPYRIGHT 2004 ACS on STN

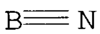
132:129810 Light emitting device using semiconductor microcrystals as emissive layer, and production process. Kojima, Shigeru; Shirai, Katsuya; Mori, Yoshifumi; Toda, Atsushi (Sony Corporation, Japan). Eur. Pat. Appl. EP 975027 A2 **20000126**, 39 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 1999-114091 19990720. PRIORITY: JP 1998-208453 19980723; JP 1999-86652 19990329.

AB On a substrate comprising quartz glass, an n-type cladding layer comprising n-type AlGaN, a light emitting layer contg. ZnO microcrystals, and a p-type cladding layer comprising p-type **BN** are laminated in this order. Between the n-type cladding layer and the p-type cladding layer, an insulating layer is formed to fill the gap among the micro-crystals to prevent a leakage elec. current. The insulating layer is formed by oxidizing the surface of the n-type cladding layer. Heat treatment in an oxygen and/or hydrogen atmospheres increases the crystallinity of the microcrystals, increasing the light emission efficiency. A device array of a large area can be formed e.g. on a glass substrate. Other nitride semiconductors (or oxide semiconductors, polymers, etc.) may be used for the cladding layers, and other semiconductors for the emissive microcryst. layers. Using zinc oxide microcrystals, the device can operate as a UV source.

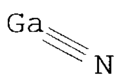
IT **10043-11-5, Boron nitride** (**BN**
), uses
(cladding layer; light emitting device using zinc oxide microcrystals)

RN 10043-11-5 HCA

CN Boron nitride (BN) (8CI, 9CI) (CA INDEX NAME)



IT **25617-97-4, Gallium nitride**
(cladding; light emitting device using zinc oxide microcrystals)
RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



IC ICM H01L033-00
ICS H01S005-10; H01S005-34; H01S005-32
CC 73-11 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
Section cross-reference(s): 74, 76
ST UV light emitting device zinc oxide microcrystal; aluminum **gallium nitride** cladding semiconductor nanoparticle LED; **boron nitride** cladding semiconductor microparticle LED
IT Annealing
Band gap
Heat treatment
Microcrystallites
Microparticles
Nanocrystals
**Polycrystalline** films
Semiconductor device fabrication
UV sources
(light emitting devices using zinc oxide microcrystals as emissive layer)
IT **10043-11-5, Boron nitride** (**BN**
), uses 106097-44-3, Aluminum **gallium nitride**
(AlGaN)
(cladding layer; light emitting device using zinc oxide microcrystals)
IT 24304-00-5, Aluminum nitride **25617-97-4, Gallium nitride** 177023-12-0, Aluminum **gallium nitride** Al0-0.5Ga0.5-1N
(cladding; light emitting device using zinc oxide microcrystals)

L53 ANSWER 13 OF 33 HCA COPYRIGHT 2004 ACS on STN
132:17330 Crystal structure and defects in nitrogen-deficient **GaN.** Oktyabrsky, S.; Dovidenko, K.; Sharma, A. K.; Joshkin, V.; Narayan, J. (Center for Advanced Materials and Smart Structures,

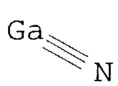
North Carolina State University, Raleigh, NC, 27695, USA). Materials Research Society Symposium Proceedings, 537(GaN and Related Alloys), G6.43/1-G6.43/6 (English) **1999.** CODEN: MRSPDH. ISSN: 0272-9172. Publisher: Materials Research Society.

AB The authors have studied the crystal structure and assocd. defects in **GaN** films grown on sapphire under N-deficient conditions by metalorg. CVD (MOCVD) and pulsed laser deposition (PLD). The structural quality of the PLD films grown at 750° was comparable with those grown by MOCVD at 1050° having threading dislocations **d.** of .apprx.1010 cm-2 at a film thickness 150-200 nm. Microstructure of the PLD films grown at temps. >780° is similar to that of N-deficient MOCVD films indicating the loss of N due to thermal decompn. of the nitride layers. N-deficient MOCVD and PLD films exhibit **polycryst** . structure with a mixt. of cubic Zn-blende and wurtzite hexagonal **GaN** grains retaining tetragonal bonding across the boundaries and hence the epitaxial orientations and polarity. Renucleation of the wurtzite phase at different {111} planes of cubic **GaN** results in a **rough** and faceted surface of the film. Most of the stoichiometric films displayed (0001) Ga-face polarity, but the renucleated inclined wurtzite grains grew in the opposite N-face polarity. The major defects related to the cubic structural metastability are stacking faults and microtwins which being nuclei of the metastable cubic phase have an extremely low energy. The authors elucidate that the cubic phase is more stable under the N deficiency and, therefore, can exist without decompn. at higher N vacancy concns. in the material.

IT **25617-97-4, Gallium nitride** (**GaN**
)
(crystal structure and defects in nitrogen-deficient **GaN** grown on sapphire under N-deficient conditions by metalorg. CVD and pulsed laser deposition)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 75-3 (Crystallography and Liquid Crystals)

ST defect crystal structure nitrogen deficient **gallium nitride** metalorg CVD

IT Crystal defects
Microstructure
Stacking faults
Threading dislocations
(crystal structure and defects in nitrogen-deficient **GaN** grown on sapphire under N-deficient conditions by metalorg. CVD

and pulsed laser deposition)

IT Vapor deposition process
(metalorg.; crystal structure and defects in nitrogen-deficient **GaN** grown on sapphire under N-deficient conditions by metalorg. CVD and pulsed laser deposition)

IT Thermal decomposition
(of nitride layer in **gallium nitride** films on sapphire grown by pulsed laser deposition)

IT Vapor deposition process
(pulsed laser; crystal structure and defects in nitrogen-deficient **GaN** grown on sapphire under N-deficient conditions by metalorg. CVD and pulsed laser deposition)

IT **25617-97-4, Gallium nitride** (**GaN**
)
(crystal structure and defects in nitrogen-deficient **GaN** grown on sapphire under N-deficient conditions by metalorg. CVD and pulsed laser deposition)

L53 ANSWER 14 OF 33 HCA COPYRIGHT 2004 ACS on STN

131:305314 Crystal structure and defects in nitrogen-deficient **GaN**. Oktyabrsky, S.; Dovidenko, K.; Sharma, A. K.; Joshkin, V.; Narayan, J. (Cent. for Advanced Mater. and Smart Structures, North Carolina State Univ., Raleigh, NC, 27695, USA). MRS Internet Journal of Nitride Semiconductor Research [Electronic Publication], 4S1, No pp. Given (English) **1999**. CODEN: MIJNF7. ISSN: 1092-5783. URL: http://nsr.mij.mrs.org/4S1/G6.43/article.pdf Publisher: Materials Research Society.

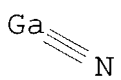
AB The authors have studied crystal structure and assocd. defects in **GaN** films grown on sapphire under N-deficient conditions by metalorg. CVD (MOCVD) and pulsed laser deposition (PLD). The structural quality of the PLD films grown at 750° was comparable with those grown by MOCVD at 1050° having threading dislocations **d.** of .apprx.1010 cm-2 at a film thickness 150-200 nm. Microstructure of the PLD films grown at temps. >780° is similar to that of N-deficient MOCVD films indicating the loss of N due to thermal decompn. of the nitride layers. N-deficient MOCVD and PLD films exhibit **polycryst**
. structure with a mixt. of cubic Zn-blende and wurtzite hexagonal **GaN** grains retaining tetragonal bonding across the boundaries and hence the epitaxial orientations and polarity. Renucleation of the wurtzite phase at different {111} plantes of cubic **GaN** results in a **rough** and faceted surface of the film. Most of the stoichiometric films displayed (0001) Ga-face polarity, but the renucleated inclined wurtzite grains grew in the opposite N-face polarity. The major defects related to the cubic structural metastability are stacking faults and microtwins which being nuclei of the metastable cubic phase have an extremely

low energy. The authors elucidate that the cubic phase is more stable under the N deficiency and, therefore, can exist without decompn. at higher N vacancy concns. in the material.

IT **25617-97-4, Gallium nitride** (**GaN**
)
(microstructure, crystal structure and defects in nitrogen-deficient **GaN** grown on sapphire under N-deficient conditions by metalorg. CVD and pulsed laser deposition)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 75-3 (Crystallography and Liquid Crystals)

ST defect structure **gallium nitride** metalorg CVD laser deposition

IT Crystal orientation
(in **gallium nitride** films grown by pulsed laser deposition)

IT Vapor deposition process
(laser-assisted; microstructure, crystal structure and defects in nitrogen-deficient **GaN** grown on sapphire under N-deficient conditions by metalorg. CVD and pulsed laser deposition)

IT Thermal decomposition
(loss of nitrogen due to thermal decompn. of nitride layer during metalorg. CVD and pulsed laser deposition of **gallium nitride** on sapphire)

IT Vapor deposition process
(metalorg.; microstructure, crystal structure and defects in nitrogen-deficient **GaN** grown on sapphire under N-deficient conditions by metalorg. CVD and pulsed laser deposition)

IT Microstructure
Stacking faults
Threading dislocations
(microstructure, crystal structure and defects in nitrogen-deficient **GaN** grown on sapphire under N-deficient conditions by metalorg. CVD and pulsed laser deposition)

IT Polarity
(of **gallium nitride** films grown by pulsed laser deposition)

IT **25617-97-4, Gallium nitride** (**GaN**
)

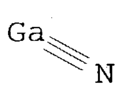
(microstructure, crystal structure and defects in nitrogen-deficient **GaN** grown on sapphire under N-deficient conditions by metalorg. CVD and pulsed laser deposition)

L53 ANSWER 15 OF 33 HCA 
131:136946 Near edge x-ray absorption fine structure characterization of **polycrystalline GaN** grown by nitridation of GaAs (001). Lubbe, M.; Bressler, P. R.; Braun, W.; Kampen, T. U.; Zahn, D. R. T. (TU Chemnitz, Chemnitz, D-09107, Germany). Journal of Applied Physics, 86(1), 209-213 (English) **1999**. CODEN: JAPIAU. ISSN: 0021-8979. Publisher: American Institute of Physics.

AB The phase compn. and microcryst. structure of thin **GaN** grown by nitridation of (001) oriented GaAs was studied by near edge x-ray absorption fine structure (NEXAFS) spectroscopy. The **GaN** layer was grown by the interaction of **at.** N produced by a radio-frequency-plasma source with the clean GaAs surface at a temp. of 700°. In this way a **GaN** film thickness of ≈100 Å was obtained after 6 h of nitridation. Using surface sensitive NEXAFS at the N K edge, the partial N p **d.** of states was detd. Comparing the data to ref. spectra of hexagonal and cubic **GaN**, the amt. of cubic **GaN** in the nitrided film is 20%-25%. Varying the angle of polarization of the synchrotron radiation with respect to the sample surface, the geometric anisotropy of the **GaN** film, and thus its cryst. structure, was probed, providing information on the orientation of the **GaN** microcrystallites. The results from the polarization dependent measurements suggest that the c axes of the hexagonal **GaN** crystallites in the film are mainly oriented parallel to the (001) direction of the GaAs substrate. The c axes of **roughly** 45% of the crystallites are tilted by 90° and lie parallel to the surface plane.

IT **25617-97-4, Gallium nitride** (**GaN**)
(near edge x-ray absorption fine structure detn. of phase compn. and microcryst. structure of **polycryst. GaN** grown by nitridation of GaAs (001))

RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)




CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 67, 73

ST growth microcryst structure **polycryst gallium nitride** nitridation arsenide

IT Crystal orientation
Microcrystallites
NEXAFS spectroscopy
Nitriding
Phase composition
(near edge x-ray absorption fine structure detn. of phase compn. and microcryst. structure of **polycryst. GaN** grown by nitridation of GaAs (001))

IT 1303-00-0, Gallium arsenide (GaAs), processes
(near edge x-ray absorption fine structure detn. of phase compn. and microcryst. structure of **polycryst. GaN** grown by nitridation of GaAs (001))

IT **25617-97-4, Gallium nitride** (**GaN**
)
(near edge x-ray absorption fine structure detn. of phase compn. and microcryst. structure of **polycryst. GaN** grown by nitridation of GaAs (001))

L53 ANSWER 16 OF 33 HCA 

131:136920 Molecular beam epitaxy growth of boron-containing nitrides. Gupta, V. K.; Wamsley, C. C.; Koch, M. W.; Wicks, G. W. (The Institute of Optics, University of Rochester, Rochester, NY, 14627, USA). Journal of Vacuum Science & Technology, B: Microelectronics and Nanometer Structures, 17(3), 1246-1248 (English) **1999**. CODEN: JVTBD9. ISSN: 0734-211X. Publisher: American Institute of Physics.

AB Layers of **BN**, BGaN and BAlN were grown by MBE using NH3 on (0001) sapphire substrates. The crystal structure and material quality of these layers were assessed by RHEED, x-ray diffraction, FTIR reflectance, and photoluminescence spectroscopy. These measurements reveal that while **BN** layers grow as **polycryst.** films, BGaN and BAlN layers grow as single crystals with B compn. up to 2% and 6%, resp. A monotonic increase in the band gap energy and a decrease in c-lattice const. were obsd. with increasing B concns. in BGaN samples. Yellow-band emission and increased surface **roughening** were also obsd. in samples with higher B compns.

IT **10043-11-5, Boron nitride** (**BN**
), properties
(MBE and RHEED, x-ray diffraction, FTIR reflectance, and photoluminescence spectroscopy of characterization on (0001) sapphire substrates of films of)

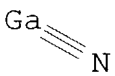
RN 10043-11-5 HCA

CN Boron nitride (BN) (8CI, 9CI) (CA INDEX NAME)

B≡N

CC 75-1 (Crystallography and Liquid Crystals)
IT Crystal structure-property relationship
(boron concn.; in boron **gallium nitride** and aluminum **boron nitride** epitaxial films on sapphire)
IT Band gap
Luminescence
Surface **roughness**
(effect of boron concn. on band gap energy of boron **gallium nitride** and aluminum **boron nitride** epitaxial films on sapphire)
IT **10043-11-5, Boron nitride (BN**
), properties 189323-31-7, Boron **gallium nitride** (B0.01Ga0.99N) 200883-16-5, Boron **gallium nitride** (B0.02Ga0.98N) 234449-95-7, Aluminum **boron nitride** (Al0.94-1B0-0.06N)
(MBE and RHEED, x-ray diffraction, FTIR reflectance, and photoluminescence spectroscopy of characterization on (0001) sapphire substrates of films of)

L53 ANSWER 17 OF 33 HCA COPYRIGHT 2004 ACS on STN
131:51344 Very strong photoluminescence emission from **GaN** grown on amorphous silica substrate by gas source MBE. Asahi, H.; Iwata, K.; Tampo, H.; Kuroiwa, R.; Hiroki, M.; Asami, K.; Nakamura, S.; Gonda, S. (Institute of Scientific and Industrial Research, Osaka University, Ibaraki, Osaka, 567, Japan). Journal of Crystal Growth, 201/202, 371-375 (English) **1999.** CODEN: JCRGAE. ISSN: 0022-0248. Publisher: Elsevier Science B.V..
AB **Polycryst. GaN** layers showing very strong photoluminescence (PL) intensities are successfully grown on amorphous fused SiO2 (SiO2) substrates by gas source MBE using an ion removed electron cyclotron resonance radical cell. The PL intensity is larger than that of undoped single cryst. **GaN** grown on sapphire by gas source MBE and is comparable to that of Si-doped single cryst. **GaN** grown on sapphire by OMVPE at Nichia Chem. The PL peak emission is considered to be excitonic. Undoped **GaN** layers grown on SiO2 substrates exhibit n-type conduction and both n- and p-type conductions are achieved by impurity doping. These results open up the area of **Polycryst.** Semiconductor Photonics.
IT **25617-97-4, Gallium nitride**
(very strong photoluminescence emission from **GaN** grown on amorphous silica substrate by gas source MBE)
RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 73-5 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
Section cross-reference(s): 75, 76
ST luminescence emission **gallium nitride** amorphous silica substrate; gas source MBE nitride elec property
IT Molecular beam epitaxy
(gas-source; very strong photoluminescence emission from **GaN** grown on amorphous silica substrate by gas source MBE)
IT Doping
(impurity; very strong photoluminescence emission from **GaN** grown on amorphous silica substrate by gas source MBE)
IT Electron **density**
Exciton luminescence
Glass substrates
Hole concentration
Luminescence
Vapor phase epitaxy
(very strong photoluminescence emission from **GaN** grown on amorphous silica substrate by gas source MBE)
IT 7631-86-9, Silica, uses
(fused substrate; very strong photoluminescence emission from **GaN** grown on amorphous silica substrate by gas source MBE)
IT 1344-28-1, Alumina, uses
(sapphire substrate; very strong photoluminescence emission from **GaN** grown on amorphous silica or sapphire substrate by gas source MBE)
IT **25617-97-4, Gallium nitride**
(very strong photoluminescence emission from **GaN** grown on amorphous silica substrate by gas source MBE)
IT 7440-55-3, Gallium, processes 7727-37-9, Nitrogen, processes
(very strong photoluminescence emission from **GaN** grown on amorphous silica substrate by gas source MBE)

L53 ANSWER 18 OF 33 HCA COPYRIGHT 2004 ACS on STN
130:260183 Pulsed laser deposition and processing of wide band gap semiconductors and related materials. Vispute, R. D.; Choopun, S.; Enck, R.; Patel, A.; Talyansky, V.; Sharma, R. P.; Venkatesan, T.; Sarney, W. L.; Salamanca-Riba, L.; Andronescu, S. N.; Iliadis, A. A.; Jones, K. A. (CSR, Department of Physics, University of Maryland, College Park, MD, 20742, USA). Journal of Electronic

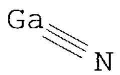
Materials, 28(3), 275-286 (English) **1999**. CODEN: JECMA5.
ISSN: 0361-5235. Publisher: Minerals, Metals & Materials Society.

AB The present work describes the novel, relatively simple, and efficient technique of pulsed laser deposition for rapid prototyping of thin films and multilayer heterostructures of wide-band-gap semiconductors and related materials. In this method, a KrF pulsed excimer laser is used for the ablation of **polycryst.**, stoichiometric targets of wide-band-gap materials. Upon laser absorption by the target surface, a strong plasma plume is produced which then condenses onto the substrate, kept at a suitable distance from the target surface. The authors have optimized processing parameters such as laser fluence, substrate temp., background gas pressure, target-to-substrate distance, and pulse repetition rate for the growth of high-quality cryst. thin films and heterostructures. The films have been characterized by x-ray diffraction, RBS and ion-channeling spectrometry, high-resoln. TEM microscopy, **at.** force microscopy, UV-visible spectroscopy, cathodoluminescence, and elec. transport measurements. The authors show that high-quality AlN and **GaN** thin films can be grown by pulsed laser deposition at relatively lower substrate temps. (750-800°) than those employed in metalorg. CVD deposition (MOCVD) (1000-1100°), an alternative growth method. The pulsed-laser-deposited **GaN** films (.apprx.0.5-μm-thick), grown on AlN buffered sapphire (0001), show an x-ray diffraction rocking curve full width at half max. of 5-7 arc-min. The ion channeling min. yield in the surface region for AlN and **GaN** is .apprx.3%, indicating a high degree of crystallinity. The optical band gaps for AlN and **GaN** are found to be 6.2 and 3.4 eV, resp. These epitaxial films are shiny, and the surface root mean square **roughness** is .apprx.5-15 nm. The elec. resistivity of the **GaN** films is in the range of 10-2-102 Ω-cm with a mobility in excess of 80 cm2V-1s-1 and a carrier concn. of 1017-1019 cm-3, depending upon the buffer layers and growth conditions. The authors have also demonstrated the application of the pulsed-laser-deposition technique for integration of technol. important materials with the III-V nitrides. The examples include pulsed laser deposition of ZnO/**GaN** heterostructures for UV-blue lasers and epitaxial growth of TiN on **GaN** and SiC for low-resistance ohmic contact metalization. By employing the pulsed laser, the authors also demonstrate a dry etching process for **GaN** and AlN films.

IT **25617-97-4**, Gallium mononitride
(pulsed laser deposition and processing of wide-band-gap semiconductors and related materials)

RN 25617-97-4 HCA

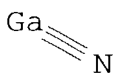
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 76-3 (Electric Phenomena)
ST laser deposition wide band gap material; aluminum nitride pulsed laser deposition; **gallium nitride** pulsed laser deposition
IT 24304-00-5, Aluminum nitride (AlN) **25617-97-4**, Gallium mononitride
(pulsed laser deposition and processing of wide-band-gap semiconductors and related materials)

L53 ANSWER 19 OF 33 HCA COPYRIGHT 2004 ACS on STN
129:223409 Growth of **GaN** Layer from the Single-Source Precursor (Et2GaNH2)3. Park, Hyung S.; Waezsada, Said D.; Cowley, Alan H.; Roesky, Herbert W. (Institut fuer Anorganische Chemie, Universitaet Goettingen, Goettingen, 37077, Germany). Chemistry of Materials, 10(8), 2251-2257 (English) **1998**. CODEN: CMATEX. ISSN: 0897-4756. Publisher: American Chemical Society.
AB In recent years, there was a great interest in new routes for depositing **GaN** films in the application of III-V semiconductors. The authors report herein on the deposition of highly cryst. **GaN** films by low-pressure MOCVD (in the low-temp. range of 500-700° and the pressure range of 77-177 mbar) using the single-source precursor (Et2GaNH2)3. This process was studied for a variety of substrates (Si(100) and **polycryst.** Al2O3) using a cold wall CVD reactor. The thickness of films grown under these conditions ranged from 6 to 8 μm, and the growth rates varied from 7 to 8 μm/h. Films deposited at lower temps. (500-550°) had a pale yellowish color and were amorphous. At 600° slightly gray colored films were obtained, while >650° high-quality cryst. films were formed, which show diffraction patterns characteristic of the hexagonal wurtzite structure. The films are consistent with the 1:1 stoichiometry of **GaN** and have C and O as impurities; however, cracks were not evident on the surface by SEM examn. up to a magnification of 30,000. In contrast, samples of **GaN** deposited under high-vacuum conditions (up to 10-2 mbar) have neither a 1:1 stoichiometry nor a **smooth** surface morphol. **At.** force microscopy, SEM, Auger electron microscopy, and energy-dispersive x-ray analyses were used for the study of the structure, compn., and morphol. of the films.
IT **25617-97-4, Gallium nitride** (**GaN**
)
(growth and surface morphol. of **GaN** cryst. layer by metalorg. CVD from single-source precursor (Et2GaNH2)3)

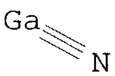
RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



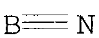
CC 75-1 (Crystallography and Liquid Crystals)
ST CVD **gallium nitride** amidoethylgallium trimer
IT Vapor deposition process
(metalorg.; growth of **GaN** cryst. layer by metalorg. CVD from single-source precursor (Et2GaNH2)3)
IT Surface structure
(of **gallium nitride** cryst. layer on alumina and silicon grown by metalorg. CVD from single-source precursor)
IT **25617-97-4, Gallium nitride** (**GaN**
)
(growth and surface morphol. of **GaN** cryst. layer by metalorg. CVD from single-source precursor (Et2GaNH2)3)
IT 190019-27-3
(growth and surface morphol. of **GaN** cryst. layer by metalorg. CVD from single-source precursor (Et2GaNH2)3)

L53 ANSWER 20 OF 33 HCA COPYRIGHT 2004 ACS on STN
129:154864 MOCVD of **BN** and **GaN** thin films on silicon: new attempt of **GaN** growth with **BN** buffer layer. Boo, Jin-Hyo; Rohr, Carsten; Ho, Wilson (Department of Chemistry, Sung Kyun Kwan University, Suwon, 440-746, S. Korea). Journal of Crystal Growth, 189/190, 439-444 (English) **1998**
. CODEN: JCRGAE. ISSN: 0022-0248. Publisher: Elsevier Science B.V..
AB Highly oriented **polycryst.** h-**BN** thin films were deposited on Si substrates at 600-900° from the single mol. precursor of borane-NEt3 complex, Et3N:BH3, by supersonic jet assisted CVD. H was used as carrier gas, and addnl. N was supplied by either NH3 through a nozzle or N via a remote microwave plasma. Hexagonal **GaN** films were also grown on Si(100) with h-**BN** buffer layers at 550-750° with dual supersonic mol. beam sources. Et3Ga and NH3 were used as precursors. H was used as seeding gas for the precursors, providing a wide range of possible kinetic energies for the supersonic beams. The h-**BN** buffer layers and the **GaN** films were characterized in situ by Auger electron spectroscopy (AES), and ex situ by XRD, FTIR spectroscopy, XPS, and optical transmission. This is the 1st report of growing h-**BN** films on Si substrates from the single source precursor of borane-NEt3 complex and new attempts of **GaN** film growth on Si with **BN** buffer layer.

IT **25617-97-4, Gallium nitride** (**GaN**
)
(metalorg. CVD of hexagonal **gallium nitride**
films on silicon with hexagonal **boron nitride**
buffer)
RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



IT **10043-11-5, Boron nitride** (**BN**
), processes
(metalorg. CVD of **polycryst.** hexagonal **BN**
films on silicon using borane-triethylamine complex)
RN 10043-11-5 HCA
CN Boron nitride (BN) (8CI, 9CI) (CA INDEX NAME)



CC 75-1 (Crystallography and Liquid Crystals)
ST MOCVD boron **gallium nitride** silicon substrate
IT Vapor deposition process
(metalorg.; of **boron nitride** and
**gallium nitride** films on silicon)
IT Metalorganic vapor phase epitaxy
(of **gallium nitride** on silicon with
**boron nitride** buffer)
IT Jets
(supersonic; metalorg. CVD of **boron nitride**
and **gallium nitride** films on silicon using)
IT **25617-97-4, Gallium nitride** (**GaN**
)
(metalorg. CVD of hexagonal **gallium nitride**
films on silicon with hexagonal **boron nitride**
buffer)
IT **10043-11-5, Boron nitride** (**BN**
), processes
(metalorg. CVD of **polycryst.** hexagonal **BN**
films on silicon using borane-triethylamine complex)
IT 1722-26-5, Boranecompd. with triethylamine (1:1)
(metalorg. CVD of **polycryst.** hexagonal **boron**
**nitride** films on silicon using)

L53 ANSWER 21 OF 33 HCA COPYRIGHT 2004 ACS on STN
129:47547 MOCVD growth of **GaN** on bulk AlN substrates. Lu,

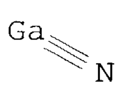
Hong-Qiang; Bhat, Ishwara B.; Lee, Byung-Chan; Slack, Glen A.; Schowalter, Leo J. (Center for Integrated Electronics and Electronics Manufacturing, Rensselaer Polytechnic Institute, Troy, NY, 12180-3590, USA). Materials Research Society Symposium Proceedings, 482(Nitride Semiconductors), 277-282 (English) **1998**. CODEN: MRSPDH. ISSN: 0272-9172. Publisher: Materials Research Society.

AB The growth of epitaxial **GaN** layers on c-plane and a-plane bulk AlN substrates by metalorg. VPE is reported. The AlN boules were grown by the sublimation-recondensation technique. Single crystal **GaN** films grown on the c-plane orientation replicate the substrate orientation. However the surface of the epilayer had a high **d.** of cross-hatch defect lines, presumably caused by mech. polishing damage. The low temp. PL spectra of these films were dominated by exciton emission at 3.470 eV with a FWHM of 14 meV at 7 K. However, **GaN** grown on the a-plane orientation AlN was **polycryst.** and the surface was **rough** with ridge-like facets. The PL from this film showed a dominate peak at 3.406 eV which may originate from defect-bound excitons. The quality of the **GaN** layers grown on these AlN bulk substrates appeared to be limited by the surface prepn. method, which was not optimized.

IT **25617-97-4, Gallium nitride** (**GaN**
)
(metalorg. VPE growth of **gallium nitride** on bulk AlN substrates and characterization)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 76

ST metalorg VPE **gallium nitride**

IT Luminescence
Surface structure
(of **gallium nitride** grown by metalorg. VPE on bulk AlN substrates)

IT Metalorganic vapor phase epitaxy
(of **gallium nitride** on bulk AlN substrates)

IT **25617-97-4, Gallium nitride** (**GaN**
)
(metalorg. VPE growth of **gallium nitride** on bulk AlN substrates and characterization)

L53 ANSWER 22 OF 33 HCA 

127:299304 Nitridation of the GaAs (001) surface using **atomic** nitrogen. Hill, P.; Westwood, D. I.; Haworth, L.; Lu, J.; Macdonald, J. E. (Department of Physics and Astronomy, University of Wales Cardiff, Cardiff, CF2 3YB, UK). Journal of Vacuum Science & Technology, B: Microelectronics and Nanometer Structures, 15(4), 1133-1138 (English) **1997**. CODEN: JVTBD9. ISSN: 0734-211X. Publisher: American Institute of Physics.

AB The effect of active N, generated by a radio frequency plasma source, on clean GaAs (001) surfaces was examd. using x-ray photoemission spectroscopy (XPS) and RHEED. The nitridation of the surface was performed under fixed plasma conditions, compatible with the mol. beam epitaxial growth of **GaN**, and as a function of both temp. (in the range .apprx.300-600°) and time (up to 15 min). At low temps. the nitridation proceeds very slowly and was characterized, in its initial stages, by the transformation of the (2+4) reconstructed GaAs surface to a high intensity amorphous haze, presumed to be related to the As released in the anion exchange reaction but not evapd. from the surface. At **high temps.** the nitridation is much more aggressive readily forming thicker **GaN** films of a **polycryst.** nature. Curve fitting of the XPS spectra, to reveal the nature of the reaction products indicated the probable formation of As-N species in addn. to **GaN**.

CC 67-3 (Catalysis, Reaction Kinetics, and Inorganic Reaction Mechanisms)

ST nitridation gallium arsenide surface **atomic** nitrogen

IT Nitriding
(nitridation of GaAs (001) surface using **at.** nitrogen)

IT Surface reconstruction
(of gallium arsenide (001) surface during nitridation using **at.** nitrogen)

IT 1303-00-0, Gallium arsenide, processes 17778-88-0, **Atomic** nitrogen, processes
(nitridation of GaAs (001) surface using **at.** nitrogen)

L53 ANSWER 23 OF 33 HCA COPYRIGHT 2004 ACS on STN

126:349778 Synthesis of bulk, **polycrystalline gallium nitride** at low pressures. Argoitia, Alberto; Angus, John C.; Hayman, Cliff C.; Wang, Long; Dyck, Jeffrey S.; Kash, Kathleen (Chemical Eng. Dept., Case Western Reserve Univ., Cleveland, OH, 44106, USA). Materials Research Society Symposium Proceedings, 449(III-V Nitrides), 47-52 (English) **1997**. CODEN: MRSPDH. ISSN: 0272-9172. Publisher: Materials Research Society.

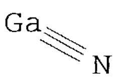
AB Bulk, **polycryst. Ga nitride** was crystd. from Ga satd. with N obtained from a microwave electron cyclotron resonance source. The **polycryst.** samples are wurtzitic and n-type. Well-faceted crystals give near-band-edge and yellow band photoluminescence at both 10K and 300K. **At.** N

is an attractive alternative to **high pressure** $N_2$ for satn. of Ga with N for synthesis of bulk **Ga nitride.**

IT **25617-97-4, Gallium nitride**
(synthesis and optical properties of bulk, **polycryst. gallium nitride** at low pressures)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 73

ST growth photoluminescence **polycryst gallium nitride**

IT Crystallization
Luminescence
Raman spectra
(synthesis and optical properties of bulk, **polycryst. gallium nitride** at low pressures)

IT **25617-97-4, Gallium nitride**
(synthesis and optical properties of bulk, **polycryst. gallium nitride** at low pressures)

L53 ANSWER 24 OF 33 HCA COPYRIGHT 2004 ACS on STN

126:111208 Low pressure synthesis of bulk, **polycrystalline gallium nitride.** Argoitia, Alberto; Hayman, Cliff C.; Angus, John C.; Wang, Long; Dyck, Jeffrey S.; Kash, Kathleen (Dep. Chemical Engineering, Case Western Reserve Univ., Cleveland, OH, 44106, USA). Applied Physics Letters, 70(2), 179-181 (English) **1997.** CODEN: APPLAB. ISSN: 0003-6951. Publisher: American Institute of Physics.

AB Thick films of **polycryst. GaN** were grown at low pressures by direct reaction of **at.** N with liq. Ga without the presence of a substrate. The crystals are wurtzitic **GaN** by x-ray diffraction, TEM, Raman spectroscopy, and elemental anal. Photoluminescence spectra showed near band edge peaks and broad yellow band emission at both 298 and 10 K. **At.** N is an attractive alternative to **high pressure** $N_2$ for the satn. of liq. Ga with N for the synthesis of bulk **GaN.**

IT **25617-97-4, Gallium nitride**
(low pressure synthesis and photoluminescence of **polycryst. gallium nitride** thick films)

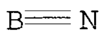
RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)

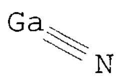
CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 73
ST deposition **polycryst gallium nitride** film photoluminescence
IT Crystallization
Luminescence
(low pressure synthesis and photoluminescence of **polycryst. gallium nitride** thick films)
IT **25617-97-4, Gallium nitride**
(low pressure synthesis and photoluminescence of **polycryst. gallium nitride** thick films)

L53 ANSWER 25 OF 33 HCA COPYRIGHT 2004 ACS on STN
122:278402 Initial stages of growth of thin films of III-V nitrides and silicon carbide polytypes b molecular beam epitaxy. Davis, Robert F.; Ailey, K. S.; Kern, R. S.; Kester, D. J.; Sitar, Z.; Smith, L.; Tanaka, S.; Wang, C. (Department Materials Science Engineering, North Carolina State University, Raleigh, NC, 27695-7907, USA). Materials Research Society Symposium Proceedings, 339(Diamond, SiC and Nitride Wide Bandgap Semiconductors), 351-62 (English) **1994**. CODEN: MRSPDH. ISSN: 0272-9172. Publisher: Materials Research Society.
AB The morphol. and interface chem. occurring during the initial deposition of **BN**, AlN and **GaN** films via metal evapn. and N2 decompn. under UHV conditions were detd. FTIR spectroscopy and TEM revealed the consecutive deposition of an initial 20 Å layer of amorphous **BN**, 20-60 Å of oriented hexagonal **BN**, and a final layer of **polycryst.** cubic **BN**. This sequence is attributed primarily to increasing intrinsic compressive stress in the films. XPS anal. revealed the growth of **GaN** on sapphire to occur via the Stranski-Krastanov mode; growth on SiC showed characteristics of three-dimensional growth. AlN grew layer-by-layer on both substrates. Vicinal 6H-SiC(0001) substrate surfaces contain closely spaced, single bilayer steps. During deposition of Si and C at 1050°, 6H layers initially form and step bunching occurs. The latter phenomenon results in more widely spaced steps, the nucleation of 3-C-SiC both on the new terraces and at the larger steps and formation of double position boundaries. The C/Si ratio in the gaseous reactants also affects the occurrence of these three phenomena.

IT **10043-11-5, Boron nitride (BN**
**)**, processes **25617-97-4, Gallium nitride**
**(GaN)**
(initial stages of film growth by MBE)
RN 10043-11-5 HCA
CN Boron nitride (BN) (8CI, 9CI) (CA INDEX NAME)



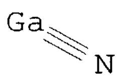
RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 75-1 (Crystallography and Liquid Crystals)
IT **10043-11-5, Boron nitride (BN**
**)**, processes 24304-00-5, Aluminum nitride (AlN) **25617-97-4**
**, Gallium nitride (GaN)**
(initial stages of film growth by MBE)

L53 ANSWER 26 OF 33 HCA COPYRIGHT 2004 ACS on STN
116:184890 The growth and characterization of **gallium**
**nitride** on sapphire and silicon. Yu, Z. J.; Sywe, B. S.; Ahmed, A. U.; Edgar, J. H. (Dep. Chem. Eng., Kansas State Univ., Manhattan, KS, 66506-5102, USA). Journal of Electronic Materials, 21(3), 383-7 (English) **1992**. CODEN: JECMA5. ISSN: 0361-5235.
AB MOCVD (metalorg. chem. vapor deposition) of **GaN** on both Si and sapphire substrates was studied at 370-1050°. The crystallinity and surface morphol. of the films varied with the deposition temps. By 1st depositing an AlN buffer layer, the crystallinity of **GaN** was improved for low temp. depositions, but little improvement in the surface morphol. was obsd. On sapphire (0001) substrates, epitaxial layers were produced at a deposition temp. as low as 500°. With Si substrates, **polycryst.** films were produced which were randomly oriented on the (111) plane and highly oriented on the (100) plane. The surfaces of the films were **smooth** and specular at low deposition temps., but degraded at **higher temps**. The energy band gaps of these films are in the vicinity of 3.4 eV, close to where they are expected. Elemental anal. by AES showed the films to be stoichiometric with low residual impurity concns.
IT **25617-97-4, Gallium nitride (GaN**
**)**
(epitaxy of, on sapphire and silicon, metalorg. vapor-phase)

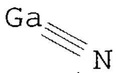
RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 75-1 (Crystallography and Liquid Crystals)
ST **gallium nitride** metalorg VPE sapphire silicon;
epitaxy **gallium nitride** sapphire silicon;
surface structure **gallium nitride** epitaxial;
energy band gap **gallium nitride** epitaxial
IT Epitaxial growth kinetics
(of **gallium nitride** on sapphire and silicon)
IT Crystallinity
Surface structure
(of **gallium nitride**, grown by metalorg. VPE
on sapphire and silicon)
IT Energy level, band structure
(gap, of **gallium nitride**, grown by metalorg.
VPE on sapphire and silicon)
IT Epitaxy
(metalorg. vapor-phase, of **gallium nitride** on
sapphire and silicon)
IT **25617-97-4, Gallium nitride** (**GaN**
)
(epitaxy of, on sapphire and silicon, metalorg. vapor-phase)

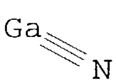
L53 ANSWER 27 OF 33 HCA COPYRIGHT 2004 ACS on STN
110:126901 Properties of sputtered nitride semiconductors. Tansley, T. L.; Egan, R. J.; Horrigan, E. C. (Phys. Dep., Macquarie Univ., North Ryde, 2109, Australia). Thin Solid Films, Volume Date 1987, 164, 441-8 (English) **1988.** CODEN: THSFAP. ISSN: 0040-6090.
AB A comparison is reported of the properties of AlN, **GaN**, and InN films reactively radio-frequency sputtered from pre-nitrided targets. All 3 have a **densely** packed (00.2) **polycrystallite** orientation, irresp. of the substrate used. Hydrogenic donors assocd. with N vacancies were found at 50, 110, and 220 meV in InN, **GaN**, and AlN, resp. Compensating acceptor levels at depths between 200 and 250 meV seem to derive from NN antisite defects. Their **densities**, which depend on the metal ion radii, are such that they partially compensate InN, sometimes fully compensate **GaN**, and always overcompensate AlN.
IT **25617-97-4, Gallium nitride** (**GaN**
)
(sputtering of, properties in relation to)
RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 76-12 (Electric Phenomena)
Section cross-reference(s): 73, 75
IT 12633-97-5, Aluminum nitride oxide **25617-97-4**,
**Gallium nitride (GaN)** 25617-98-5,
Indium nitride (InN)
(sputtering of, properties in relation to)

L53 ANSWER 28 OF 33 HCA 
105:89100 Gallium arsenide single crystal. Yamanaka, Hideki; Tsukuda, Yasuo (Hitachi, Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 61036196 A2 **19860220** Showa, 6 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1984-156762 19840727.
AB A low-dislocation-d. semi-insulating GaAs single crystal doped with In and N, having segregation coeffs. of <1 and >1, resp., is grown by the liq.-encapsulated Czochralski method. The concns. of In and N may be 1018-1020 cm-3 and the sum of the concns. in the growth direction (e.g., [100]) may be >6 + 1018 cm-3. The dislocation d. may be <1000 cm-2 over the entire crystal and **GaN** may be used for doping with N. Thus, **polycryst**. GaAs 1.5 kg, In 2.9 g, and **GaN** 2.75 mg were melted and a GaAs crystal having a const.-diam. portion 100 mm long and 52 mm in diam. was grown at 6 mm/min. Wafers cut from the crystal had dislocation d. <200 cm-2 except for the periphery and leakage current of 8 ± 0.2 μA.
IT **25617-97-4**
(in Czochralski growth of nitrogen-doped gallium arsenide)
RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)

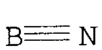


IC ICM C30B015-04
ICS C30B029-42
ICA H01L021-208
CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 76
ST gallium arsenide crystal growth; indium doped gallium arsenide Czochralski; nitrogen doped gallium arsenide Czochralski; dislocation **density** decrease gallium arsenide; nitride gallium nitrogen doping

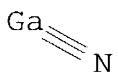
IT **25617-97-4**
(in Czochralski growth of nitrogen-doped gallium arsenide)

L53 ANSWER 29 OF 33 HCA COPYRIGHT 2004 ACS on STN
91:166667 Determination of elastic constants of hexagonal crystals from measured values of dynamic **atomic** displacements. Sheleg, A. U.; Savastenko, V. A. (Inst. Fiz. Tverd. Tela Poluprovodn., Minsk, USSR). Izvestiya Akademii Nauk SSSR, Neorganicheskie Materialy, 15(9), 1598-602 (Russian) **1979**. CODEN: IVNMAW. ISSN: 0002-337X.
AB A method is developed for evaluation of all tensor components of Cij elastic consts. of hexagonal crystals from mean-square values of the dynamic displacement of atoms from equil. positions (measured on **polycrystals**) and their elastic moduli. It is proposed that the method be used for evaluation of elastic consts. of **BN** (wurtzite type), **GaN**, and InN with hcp. structure.
CC 75-4 (Crystallization and Crystal Structure)
IT Elasticity
(detn. of, of hexagonal crystals from dynamic **at.** displacement measurements)
IT Crystal structure types
(hcp., elasticity of, detn. of, from dynamic **at.** displacement measurements)
IT Crystal structure types
(hexagonal, elasticity of, detn. of, from dynamic **at.** displacement measurements)

L53 ANSWER 30 OF 33 HCA COPYRIGHT 2004 ACS on STN
88:82685 Properties of some III-V compounds in thin films realized by sputtering. Lagorsse, J. M.; Serzec, B.; Cachard, M.; Menoret, M.; Puychevrier, N. (Lignes Telegr. Teleph., Conflans Sainte Honorine, Fr.). Proc. Int. Vac. Congr., 7th, Volume 3, 1995-7. Editor(s): Dobrozemsky, R.; Ruedenauer, F.; Viehboeck, F. P. R. Dobrozemsky: Vienna, Austria. (English) **1977**. CODEN: 37JNA6.
AB The sputter prepn. and crystallog., optical, and elec. properties of AlN, **BN**, and **GaN** films for MIS transistors are described. **Polycryst.** AlN films were obtained on glass substrates by sputtering Al targets in N. Single-crystal films were obtained at 1200° on sapphire. All **BN** films were amorphous. The capacitance-voltage characteristics of the AlN films are given. AlN and **BN** MIS transistors are described.
IT **10043-11-5**, uses and miscellaneous **25617-97-4**
(sputtering of, for MIS transistors)
RN 10043-11-5 HCA
CN Boron nitride (BN) (8CI, 9CI) (CA INDEX NAME)



RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 76-13 (Electric Phenomena)
Section cross-reference(s): 75
ST sputtering nitride film; aluminum nitride sputtering; **boron nitride** sputtering; **gallium nitride** sputtering; capacitance voltage aluminum nitride; transistor nitride film; MIS nitride transistor
IT **10043-11-5**, uses and miscellaneous 24304-00-5
**25617-97-4**
(sputtering of, for MIS transistors)

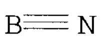
L53 ANSWER 31 OF 33 HCA COPYRIGHT 2004 ACS on STN
86:148183 Photoluminescence and electroluminescence studies of hot-pressed **polycrystalline** mixed zinc sulfide-zinc selenide powders. Low, Norman M. P.; Kennedy, David I. (Res. Dev. Div., Bowmar Canada Ltd., Ottawa, ON, Can.). Journal of Luminescence, 15(1), 87-99 (English) **1977**. CODEN: JLUMA8. ISSN: 0022-2313.
AB An investigation had been conducted to study the photoluminescence and electroluminescence of **polycryst.** mixed ZnS-ZnSe powders. A hot-pressing process is developed to compress the powders into good quality and high bulk **density** substrates which are suitable for fabricaion of light-emitting devices. A series of devices based on the metal-semiconductor device structure have been prepd. and these devices emit light varying from yellow-orange to green-blue. The room temp. quantum efficiency of the devices emitting in the green-blue region is found in the 10-5-10-4 photons/electron range which is about an order of magnitude lower than the reported max. efficiency values for the blue-emitting devices based on ZnS and **GaN** single crystals. The hot-pressed ZnS-ZnSe mixts. are solid solns. and exhibit similar luminescent characteristics as those of the Zn sulpho-selenide single crystal materials. A spectral shift with compositional changes is obsd. in both photoluminescence and electroluminescence.
CC 73-3 (Spectra by Absorption, Emission, Reflection, or Magnetic Resonance, and Other Optical Properties)
Section cross-reference(s): 76

L53 ANSWER 32 OF 33 HCA COPYRIGHT 2004 ACS on STN
85:152805 Synthesis of III-V semiconductor nitrides by reactive cathodic

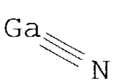
sputtering. Puychevrier, N.; Menoret, M. (Cent. Natl. Etud Telecommun., Bagneux, Fr.). Thin Solid Films, 36(1), 141-5 (English) **1976**. CODEN: THSFAP. ISSN: 0040-6090.

AB By using a reactive cathodic sputtering process with N gas, semiconducting compds. InN, AlN, **GaN** and **BN** were synthesized. The **polycryst.** InN obtained had band gajps at 2.07 and 2.21 eV at room temp. and $77^{\circ}$K, resp. The mobility was initially 20 cm2 V-1 sec-1 and was 50 cm2 V-1 sec-1 after annealing. The resistivity was 10-3-10-2 Ω. **GaN** had mobilities of .apprx.300 cm2 V-1 sec-1. The band gap for AlN was 5.9 eV with c parameter of 4.986 Å. The **BN** film was found to be amorphous and insulating.

IT **10043-11-5**
(sputtering of)
RN 10043-11-5 HCA
CN Boron nitride (BN) (8CI, 9CI) (CA INDEX NAME)



IT **25617-97-4**
(sputtering of semiconducting)
RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



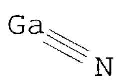
CC 76-13 (Electric Phenomena)
Section cross-reference(s): 75
IT **10043-11-5**
(sputtering of)
IT 24304-00-5 **25617-97-4** 25617-98-5
(sputtering of semiconducting)

L53 ANSWER 33 OF 33 HCA COPYRIGHT 2004 ACS on STN
71:106108 Preparation and structural properties of **GaN** thin films. Kosicki, Bernard Brooks; Kahng, Dawon (Bell Teleph. Lab., Inc., Murray Hill, NJ, USA). Journal of Vacuum Science and Technology, 6(4), 593-6 (English) **1969**. CODEN: JVSTAL. ISSN: 0022-5355.

AB A method is described that is capable of producing **GaN** thin films on either heated or unheated substrates. This method makes use of a remote gas discharge to dissoc. mol. N2 into **at.** N, which is then able to combine with Ga being evapd. onto the substrate. By using glancing-angle x-ray diffraction and reflection electron diffraction techniques, structural properties of

**GaN** thin films grown with this system on substrates of fused quartz, and oriented GaAs and Al2O3, were studied. At low substrate temps., **smooth**, transparent **polycryst.** films result, while at>550°, epitaxial **GaN** was obtained on both {111} faces of GaAs and on {0001} faces of Al2O3. The epitaxial films show a simple orientational relation to these substrates.

IT **25617-97-4**
(epitaxy of, on aluminum oxide and gallium arsenide)
RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)




CC 70 (Crystallization and Crystal Structure)
ST **gallium nitrides** films; nitrides Ga films; structure **Ga nitride** films
IT Epitaxy
(of **gallium nitride** films on aluminum oxide and gallium arsenide)
IT Crystal growth
(of **gallium nitride** films on fused silica)
IT 7631-86-9, vitreous
(crystal growth of **gallium nitride** films on)
IT **25617-97-4**
(epitaxy of, on aluminum oxide and gallium arsenide)
IT 1303-00-0, properties 1344-28-1, properties
(epitaxy on, of **gallium nitride**)

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(probably pretty junky from here on out)

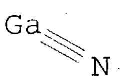
L54 ANSWER 1 OF 51 HCA COPYRIGHT 2004 ACS on STN
138:177411 Infrared reflectance analysis of **GaN** epitaxial layers grown on sapphire and silicon substrates. Feng, Z. C.; Yang, T. R.; Hou, Y. T. (Axcel Photonics, Marlborough, MA, 01752, USA). Materials Science in Semiconductor Processing, 4(6), 571-576 (English) **2001**. CODEN: MSSPFQ. ISSN: 1369-8001. Publisher: Elsevier Science Ltd..
AB IR reflectance (IR) of **GaN** grown on sapphire and Si substrates was studied both theor. and exptl. The theor. calcn. of the IR spectra is based on the transfer matrix method. The IR spectral characteristics influenced by several factors, such as film thickness, incident angle, free carriers, are systematically examd. Combined with exptl. results, surface scattering and interface layer effects are also studied. For **GaN** epilayers grown on

sapphire, carrier concns. and mobility are detd. by fitting to the IR reststrahlen band and compared with the Hall measurement. The interface effect is demonstrated to cause a damping behavior of the interference fringes away from the reststrahlen band. For **GaN** grown on Si, the IR spectra predicted the large surface **roughness** of the epilayers. A variation of IR reststrahlen band is correlated to the microstructures of the films, i.e. their **polycryst.** nature of the **GaN** films grown on Si. A three-component effective medium model is proposed to calc. the IR spectra for **polycryst. GaN,** and a qual. correlation between the IR spectra and structure of the film is established. All results show that IR, as a nondestructive method, is efficient for characterizing **GaN** epilayers in semiconductor processing.

IT **25617-97-4, Gallium nitride**
(IR reflectance anal. of **GaN** epitaxial layers grown on sapphire and silicon substrates)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)




CC 73-3 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
Section cross-reference(s): 76

ST IR reflectance **gallium nitride** epitaxial layer sapphire silicon substrate

IT IR reflectance spectra
IR spectra
Surface **roughness**
(IR reflectance anal. of **GaN** epitaxial layers grown on sapphire and silicon substrates)

IT Electric current carriers
(concn.; IR reflectance anal. of **GaN** epitaxial layers grown on sapphire and silicon substrates)

IT **25617-97-4, Gallium nitride**
(IR reflectance anal. of **GaN** epitaxial layers grown on sapphire and silicon substrates)

IT 1344-28-1, Alumina, uses
(sapphire substrate; IR reflectance anal. of **GaN** epitaxial layers grown on sapphire and silicon substrates)

IT 7440-21-3, Silicon, uses
(substrate and dopant; IR reflectance anal. of **GaN** epitaxial layers grown on sapphire and silicon substrates)

L54 ANSWER 2 OF 51 HCA 

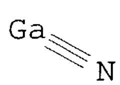
137:39605 Process and apparatus for the growth of nitride materials. Harris, Meckie T.; Suscavage, Michael J.; Bliss, David F.; Bailey, John S.; Callahan, Michael (United States Dept. of the Air Force, USA). U.S. US 6406540 B1 20020618, 9 pp. (English). CODEN: USXXAM. APPLICATION: US 1999-299928 19990427.

AB A process and app. are given for producing products of M-nitride materials wherein M = Ga (**GaN**), Al (AlN), In (InN), Ge (GeN), Zn (ZnN) and ternary nitrides and alloys such as Zn Ge nitride or In Al **Ga nitride.** This process and app. produce either free-standing single crystals, or deposit layers on a substrate by epitaxial growth or **polycryst.** deposition. Also high purity M-nitride powders may be synthesized. The process uses an ammonium halide such as ammonium chloride, ammonium bromide or ammonium iodide and a metal to combine to form the M-nitride which deposits in a cooler region downstream from and/or immediately adjacent to the reaction area. High purity M-nitride can be nucleated from the vapor to form single crystals or deposited on a suitable substrate as a high **d.** material. High purity M-nitride single crystals can be grown by the direct reaction of the halide with the M-metal in a range of sizes from a few micrometers to centimeters, depending on the growth conditions. The small sized crystals are recovered as high purity M-nitride powder while the larger crystals can be prepd. as substrates for electronic devices or UV/blue/green emitting diodes and lasers. The deposited layers can be used as M-nitride substrates, or targets for pulsed laser deposition (PLD), or other systems requiring high **d.** targets. The deposition process, and subsequent **d.** of the resulting component, is controlled by the reaction medium and by adjusting the temp. of the ammonium halide in an area near but sep. from the reaction zone. Thickness of deposition on the substrates by the same process involves placement of the substrates in a suitable area in the reaction chamber and may be further controlled using N, N-H mixts. or other suitable controlling gas to facilitate uniform distribution of the layer.

IT **25617-97-4, Gallium nitride**
(app. and method for growth of cryst.)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



IC ICM C30B023-06

NCL 117104000

CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 73, 76

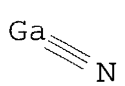
ST nitride cryst growth method app; **gallium nitride**

cryst growth method app
IT 12064-98-1, Germanium nitride gen 24304-00-5, Aluminum nitride
**25617-97-4, Gallium nitride**
25617-98-5, Indium nitride 128579-03-3, Zinc nitride
(app. and method for growth of cryst.)

L54 ANSWER 3 OF 51 HCA COPYRIGHT 2004 ACS on STN
136:271216 Benefits of microscopy with super resolution. Kisielowski, C.; Principe, E.; Freitag, B.; Hubert, D. (National Center for Electron Microscopy, Ernest Orlando Lawrence Berkeley National Laboratory, Berkeley, CA, 94720, USA). Physica B: Condensed Matter (Amsterdam, Netherlands), 308-310, 1090-1096 (English) **2001**. CODEN: PHYBE3. ISSN: 0921-4526. Publisher: Elsevier Science B.V..

AB TEM microscopy developed from an imaging tool into a quant. electron beam characterization tool that locally accesses structure, chem., and bonding in materials with sub-Angstrom resoln. Expts. utilize coherently and incoherently scattered electrons. In this contribution, the interface between **gallium nitride** and sapphire as well as thin silicon gate oxides are studied to understand underlying phys. processes and the strength of the different microscopy techniques. An investigation of the **GaN**/sapphire interface benefits largely from the application of phase contrast microscopy that makes it possible to visualize dislocation core structures and single columns of oxygen and nitrogen at a closest spacing of 85 pm. In contrast, it is adequate to investigate Si/SiOxNy/poly-Si interfaces with incoherently scattered electrons and electron spectroscopy because amorphous and **poly-cryst.** materials are involved. Here, it is demonstrated that the SiOxNy/poly-Si interface is **rougher** than the Si/SiOx interface, that desirable nitrogen diffusion gradients can be introduced into the gate oxide, and that a nitridation coupled with annealing increases its phys. width while reducing the equiv. elec. oxide thickness to values approaching 1.2 nm. Therefore, an amorphous SiNxOy gate dielec. seems to be a suitable substitute for traditional gate oxides to further increase device speed by reducing dimensions in Si technol.

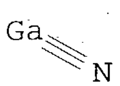
IT **25617-97-4**, Gallium mononitride
(microscopy with super resoln.in study of interface between **GaN** and sapphire as well as silicon gate oxides)
RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 76-3 (Electric Phenomena)

ST microscopy **gallium nitride** sapphire silica
interface
IT Oxides (inorganic), properties
(gate; microscopy with super resoln.in study of interface between **GaN** and sapphire as well as silicon gate oxides)
IT Interface
(microscopy with super resoln.in study of interface between **GaN** and sapphire as well as silicon gate oxides)
IT 7631-86-9, Silicon dioxide, properties
(gate oxide; microscopy with super resoln.in study of interface between **GaN** and sapphire as well as silicon gate oxides)
IT 1317-82-4, Sapphire **25617-97-4**, Gallium mononitride
(microscopy with super resoln.in study of interface between **GaN** and sapphire as well as silicon gate oxides)

L54 ANSWER 4 OF 51 HCA 
136:158468 Hydrogenated **polycrystalline GaN** surface light-emitting devices on transparent conductive glass. Yagi, Shigeru; Suzuki, Seiji; Iwanaga, Takeshi (New Business Cent., Fuji Xerox Co., Ltd., 1600 Takematsu, Minamiashigara, Kanagawa, 250-0111, Japan). Japanese Journal of Applied Physics, Part 2: Letters, 40(12B), L1349-L1351 (English) **2001**. CODEN: JAPLD8. Publisher: Japan Society of Applied Physics.
AB Electroluminescence (EL) from hydrogenated **polycryst. GaN** surface light-emitting devices is reported for the 1st time. The devices consist of a simple sandwich-type cell of films grown at 380° on In-Sn-oxide coated glass and Al substrates with an Au electrode. Pale yellow EL is obsd. at room temp. in a lighted room at wavelengths ranging from 450 nm to 700 nm with a peak at 570 nm. Luminance is 7 cd/m2 at an applied **d**.c. voltage of 7 V and a current of 35 mA.
IT **25617-97-4, Gallium nitride**
(hydrogenated **polycryst. GaN** surface light-emitting devices on transparent conductive glass)
RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)




CC 73-11 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
ST hydrogenated **polycryst gallium nitride**
LED; surface light emitting diode transparent conductive glass
IT Electroluminescent devices
Glass substrates

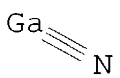
Luminescence, electroluminescence
(hydrogenated **polycryst. GaN** surface
light-emitting devices on transparent conductive glass)
IT 7439-95-4, Magnesium, uses
(dopant; hydrogenated **polycryst. GaN** surface
light-emitting devices on transparent conductive glass)
IT 7440-57-5, Gold, uses
(electrode; hydrogenated **polycryst. GaN**
surface light-emitting devices on transparent conductive glass)
IT 50926-11-9, Indium tin oxide
(hydrogenated **polycryst. GaN** surface
light-emitting devices on transparent conductive glass)
IT 1333-74-0, Hydrogen, occurrence
(hydrogenated **polycryst. GaN** surface
light-emitting devices on transparent conductive glass)
IT **25617-97-4, Gallium nitride**
(hydrogenated **polycryst. GaN** surface
light-emitting devices on transparent conductive glass)
IT 7429-90-5, Aluminum, uses
(substrate; hydrogenated **polycryst. GaN**
surface light-emitting devices on transparent conductive glass)

L54 ANSWER 5 OF 51 HCA COPYRIGHT 2004 ACS on STN
136:141868 Strong photoluminescence emission from **polycrystalline GaN** grown on metal substrate by NH3 source MBE. Asahi, H.; Tampo, H.; Yamada, K.; Ohnishi, K.; Imanishi, Y.; Asami, K. (The Institute of Scientific and Industrial Research, Osaka University, Osaka, 567-0047, Japan). Physica Status Solidi A: Applied Research, 188(2), 601-604 (English) **2001**
. CODEN: PSSABA. ISSN: 0031-8965. Publisher: Wiley-VCH Verlag Berlin GmbH.

AB **Polycryst. GaN** layers were grown on Mo and electron-beam-deposited Mo/glass substrates with improved surface **smoothness** by NH3 source MBE. X-ray diffraction rocking curves showed preferential **GaN**(0002) orientation. Strong photoluminescence (PL) emission without yellow luminescence was obsd. from these **polycryst. GaN** layers. For the previously-grown **GaN** on metal substrates 2 PL peaks were obsd. at .apprx.3.48 and 3.27 eV at 77 K, while for the **GaN** grown the 3.27 eV peak was eliminated. This improvement is considered to be mainly due to the improved surface morphol. of the substrates and the origin of the 3.27 eV peak was attributed to the cubic **GaN** phase. The 3.48 eV peak is the excitonic peak from the hexagonal **GaN** phase.

IT **25617-97-4, Gallium nitride** (**GaN**
)
(strong photoluminescence emission from **polycryst. GaN** grown on metal substrate by NH3 source MBE)

RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 73-5 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
ST luminescence **gallium nitride** ammonia MBE
IT Electron beams
Exciton
Glass substrates
Luminescence
Molecular beam epitaxy
Surface **smoothness**
Surface structure
X-ray diffraction
(strong photoluminescence emission from **polycryst. GaN** grown on metal substrate by NH3 source MBE)
IT 7439-98-7, Molybdenum, uses 7664-41-7, Ammonia, uses
**25617-97-4, Gallium nitride** (**GaN**
)
(strong photoluminescence emission from **polycryst. GaN** grown on metal substrate by NH3 source MBE)

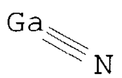
L54 ANSWER 6 OF 51 HCA 
136:61701 **GaN** MOCVD growth on ZnAl2O4/$\alpha$-Al2O3 substrates. Bi, Zhao-xia; Zhang, Rong; Li, Wei-ping; Yin, Jiang; Shen, Bo; Zhou, Yu-gang; Chen, Peng; Chen, Zhi-zhong; Gu, Shu-lin; Shi, Yi; Liu, Zhi-guo; Zheng, You-dou (National Laboratory of Solid State Microstructures, Department of Physics, Nanjing University, Nanjing, 210093, Peop. Rep. China). Bandaoti Xuebao, 22(8), 1025-1029 (Chinese) **2001**. CODEN: PTTPDZ. ISSN: 0253-4177. Publisher: Kexue Chubanshe.
AB One-step growth of **GaN** films on ZnAlO2/$\alpha$-Al2O3 substrates via metalorg. chem. vapor phase deposition (MOCVD) was studied. ZnO films are directly deposited on $\alpha$-Al2O3 by pulsed laser deposition (PLD), and ZnAl2O4 layers were synthesized by annealing ZnO/$\alpha$-Al2O3 wafers at a **high temp.** of 1100°. **GaN** films are then grown on these combined substrates via light-radiation heating low-pressure MOCVD. XRD pattern of ZnAl2O4/$\alpha$-Al2O3 shows peaks of ZnAl2O4 (111). When the annealing time during the ZnAl2O4 formation increases from <30 min to 20 h, the morphol. of ZnAl2O4 surface changes from the uniform islands to the bulgy-line structures, while the structure of corresponding **GaN** films directly deposited on these substrates changes from the c-axis

single crystal to **poly-cryst.**. x-ray rocking
curve of **GaN** shows the FWHM of 0.4°. Islands on
thin ZnAl2O4 layer can promote nucleation at the initial stage of
**GaN** growth, so as to increase the quality of **GaN**
film.

IT **25617-97-4, Gallium nitride** (**GaN**
)
(one-step growth of **GaN** in MOCVD on
ZnAl2O4/α-Al2O3 substrates)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 75-1 (Crystallography and Liquid Crystals)

ST **gallium nitride** metalorg CVD growth aluminum
zinc oxide alumina

IT Surface structure
(effect of annealing on aluminum zinc oxide substrate and
**gallium nitride** MOCVD)

IT Vapor deposition process
(metalorg.; one-step growth of **GaN** in MOCVD on
ZnAl2O4/α-Al2O3 substrates)

IT Crystal nucleation
(promotion of initial stage of **GaN** growth on ZnAl2O4 by
annealing substrate during MOCVD)

IT 12068-53-0, Aluminum zinc oxide (Al2ZnO4)
(one-step growth of **GaN** in MOCVD on
ZnAl2O4/α-Al2O3 substrates)

IT **25617-97-4, Gallium nitride** (**GaN**
)
(one-step growth of **GaN** in MOCVD on
ZnAl2O4/α-Al2O3 substrates)

L54 ANSWER 7 OF 51 HCA 

135:234072 Solid C60 growth on hexagonal **GaN** (0001) surface.
Takashima, H.; Nakaya, M.; Yamamoto, A.; Hashimoto, A. (Department
of Electrical and Electronics Engineering, Faculty of Engineering,
Fukui University, Fukui-shi, Fukui, 910-8507, Japan). Journal of
Crystal Growth, 227-228, 829-833 (English) **2001**. CODEN:
JCRGAE. ISSN: 0022-0248. Publisher: Elsevier Science B.V..

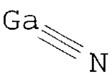
AB Growth of solid C60 thin film on a hexagonal **GaN** (00011)
surface was studied. Epitaxial growth of the fcc. C60 thin solid
film was achieved on a flat surface, while the **polycryst.**
C60 film has only been obtained on a **rough** surface. The
results indicate that the epitaxial growth of single cryst. C60

layer on the h-**GaN** (0001) surface is very sensitive to the surface morphol., because of very weak van der Waals interaction between the C60 mols. and the chem. inactive h-**GaN** (0001) surface.

IT **25617-97-4, Gallium nitride**
(surface **roughness** of **gallium nitride** substrate effect on solid-source MBE of C60 on hexagonal **GaN** (0001) surface)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)




CC 75-1 (Crystallography and Liquid Crystals)

ST fullerene MBE **gallium nitride** surface; **gallium nitride** substrate surface **roughness** fullerene MBE

IT Surface **roughness**
(of **gallium nitride** substrate effect on solid-source MBE of C60 on hexagonal **GaN** (0001) surface)

IT Molecular beam epitaxy
(solid-source MBE of C60 on hexagonal **GaN** (0001) surface)

IT 99685-96-8, C60 Fullerene
(solid-source MBE of C60 on hexagonal **GaN** (0001) surface)

IT **25617-97-4, Gallium nitride**
(surface **roughness** of **gallium nitride** substrate effect on solid-source MBE of C60 on hexagonal **GaN** (0001) surface)

L54 ANSWER 8 OF 51 HCA COPYRIGHT 2004 ACS on STN

135:173118 **High temperature** x-ray diffraction study of LiGaO2. Rawn, C. J.; Chaudhuri, J. (High Temperature Materials Laboratory, Oak Ridge National Laboratory, Oak Ridge, TN, 37831-6064, USA). Journal of Crystal Growth, 225(w2-4), 214-220 (English) **2001**. CODEN: JCRGAE. ISSN: 0022-0248. Publisher: Elsevier Science B.V..

AB In recent years LiGaO2 has been gaining attention as a substrate material for the growth of **GaN**. Since film deposition is generally carried out at **high temps.** the behavior of the substrate at processing temps. should be known. The lattice consts. of **polycryst.** LiGaO2 were measured from room temp. to 1423 K and the linear thermal expansion coeffs. at 293-1423 K are αa = 10.1 ± 0.2 + 10-6 K-1, αb =

21.1 ± 0.3 + 10-6 K-1, and $\alpha c$ = 13.6 ± 0.2 +
10-6 K-1. **High temp.** x-ray powder diffraction
data show that at >1173 K the Ga rich phases, LiGa508 and Ga2O3,
start to form indicating volatilization of the Li from the
structure.

CC 75-4 (Crystallography and Liquid Crystals)
Section cross-reference(s): 78

L54 ANSWER 9 OF 51 HCA COPYRIGHT 2004 ACS on STN

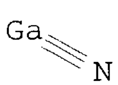
135:114531 MBE growth of different hexagonal **GaN** crystal structures on vicinal (100) GaAs substrates. Georgakilas, A.; Czigany, Z.; Amimer, K.; Davydov, V. Y.; Toth, L.; Pecz, B. (IESL/FORTH and Physics Department/University Crete, Heraklion, 71110, Greece). Materials Science & Engineering, B: Solid-State Materials for Advanced Technology, B82(1-3), 16-18 (English) **2001**. CODEN: MSBTEK. ISSN: 0921-5107. Publisher: Elsevier Science S.A..

AB **GaN** thin films of different hexagonal crystal structures were grown by radio-frequency N plasma source MBE (RFMBE) on vicinal (100) GaAs substrates. **Polycryst.** hexagonal material occurred for **high temp.** (630°) nitridation of the GaAs surface or low temps. of the initial **GaN** buffer layer deposition. On the contrary, initial **GaN** growth at 540° gave hexagonal single crystals with [0001] axis either inclined at .apprx.43° from the growth axis or aligned parallel to it. The **GaN** orientation depended on the annealing or not, resp., of the initial low temp. buffer layer.

IT **25617-97-4, Gallium nitride** (**GaN**
)
(plasma MBE growth of different hexagonal **GaN** crystal structures on vicinal (100) GaAs substrates and epitaxial layer/substrate orientation relation)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)




CC 75-1 (Crystallography and Liquid Crystals)

ST **gallium nitride** hexagonal plasma MBE gallium arsenide

IT Nitriding
(of gallium arsenide (100) substrates in buffer layer formation in plasma MBE of **gallium nitride**)

IT Crystal orientation
(of **gallium nitride** on gallium arsenide (100)

substrates grown by plasma MBE)

IT Molecular beam epitaxy
(plasma-assisted; growth of different hexagonal **GaN** crystal structures on vicinal (100) GaAs substrates by)

IT 1303-00-0, Gallium arsenide (GaAs), properties
(nitridation of gallium arsenide (100) substrates in buffer layer formation in plasma MBE of **gallium nitride** and epitaxial layer/substrate orientation relation)

IT **25617-97-4, Gallium nitride** (**GaN**
)
(plasma MBE growth of different hexagonal **GaN** crystal structures on vicinal (100) GaAs substrates and epitaxial layer/substrate orientation relation)

L54 ANSWER 10 OF 51 HCA COPYRIGHT 2004 ACS on STN

135:99994 Comparison of different substrate pre-treatments on the quality of **GaN** film growth on 6H-, 4H-, and 3C-SiC. Lee, K. H.; Hong, M. H.; Teker, K.; Jacob, C.; Pirouz, P. (Department of Materials Science and Engineering, Case Western Reserve University, Cleveland, OH, 44106, USA). Materials Research Society Symposium Proceedings, 622(Wide-Bandgap Electronic Devices), T6.16.1-T6.16.6 (English) **2001**. CODEN: MRSPDH. ISSN: 0272-9172. Publisher: Materials Research Society.

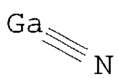
AB Together with sapphire, SiC is the most common substrate material for **GaN** epitaxial growth. In fact, SiC has advantages over sapphire because of its better thermal cond. and lower film substrate lattice mismatch (.apprx.3.5%). However, nucleation of **GaN** on SiC is rather difficult because of the low surface energy of SiC and the sensitivity of substrate prepn. This latter point makes it essential to use a very careful cleaning step, and also to pre-treat the substrate surface by growing a thick buffer layer of AlN at a relatively **high temp.** Several pre-treatment steps of SiC for **GaN** deposition were tested including (a) nitration with NH3 for 0.5-20 min, (b) pre-adsorption of tri-MeGa (TMG) or tri-MeAl (TMA) for 0.5-5 min, and (c) deposition of an AlN buffer layer at .apprx.1150°. After each pre-treatment, **GaN** was deposited by MOCVD using dil. H2 (Ar+12%H2), NH3 and TMG All the films were characterized by XRD and cross-sectional TEM. After nitration of SiC, the deposited **GaN** film is **polycryst.** In case of pre-adsorption of TMG, epitaxial but island-like **GaN** formed on the substrate. In the 3rd case, with an ultra-thin (.apprx.1.5nm) coverage of AlN on SiC (by pre-adsorption of TMA or by 50 s deposition of AlN), **GaN** epilayers were successfully deposited on SiC. However, when AlN was deposited for longer than 3 min (up to 10 min), only **polycryst. GaN** was obtained. With this technique of covering the surface with an ultra-thin layer of AlN, epitaxial **GaN** was successfully

deposited on 6H-SiC (0001), on 4H-SiC(0001), and on 3C-SiC/Si(111) substrates. The effect of the different pre-treatments of SiC on the quality of the deposited **GaN** films are discussed and compared, and the optimal conditions for **GaN** deposition for each substrate will be presented.

IT **25617-97-4, Gallium nitride** (**GaN**
)
(comparison of different substrate pre-treatments on quality of **GaN** film growth by VPE on 6H-, 4H-, and 3C-SiC)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)




CC 75-1 (Crystallography and Liquid Crystals)

ST substrate pretreatment quality **gallium nitride** VPE silicon carbide

IT Cleaning
Nitration
Surface reaction
Vapor phase epitaxy
(comparison of different substrate pre-treatments on quality of **GaN** film growth by VPE on 6H-, 4H-, and 3C-SiC)

IT Crystal nucleation
(low temp. **gallium nitride** nucleation in relation to pre-treatments of silicon carbide substrate during VPE)

IT 409-21-2, Silicon carbide (SiC), properties **25617-97-4, Gallium nitride** (**GaN**)
(comparison of different substrate pre-treatments on quality of **GaN** film growth by VPE on 6H-, 4H-, and 3C-SiC)

L54 ANSWER 11 OF 51 HCA COPYRIGHT 2004 ACS on STN

135:53864 Recent advances in ZnO materials and devices. Look, D. C. (Semiconductor Research Center, Wright State University, Dayton, OH, 45435, USA). Materials Science & Engineering, B: Solid-State Materials for Advanced Technology, B80(1-3), 383-387 (English) **2001**. CODEN: MSBTEK. ISSN: 0921-5107. Publisher: Elsevier Science S.A..

AB A review with 27 refs. Wurtzitic ZnO is a wide-bandgap (3.437 eV at 2 K) semiconductor which has many applications, such as piezoelec. transducers, varistors, phosphors, and transparent conducting films. Most of these applications require only **polycryst.** material; however, recent successes in producing large-area single crystals have opened up the possibility of producing blue and UV light emitters, and **high-temp., high**

-power transistors. The main advantages of ZnO as a light emitter are its large exciton binding energy (60 meV), and the existence of well-developed bulk and epitaxial growth processes; for electronic applications, its attractiveness lies in having high breakdown strength and high satn. velocity. Optical UV lasing, at both low and **high temps.**, has already been demonstrated, although efficient elec. lasing must await the further development of good, p-type material. ZnO is also much more resistant to radiation damage than are other common semiconductor materials, such as Si, GaAs, CdS, and even **GaN**; thus, it should be useful for space applications.

CC 76-0 (Electric Phenomena)
Section cross-reference(s): 73

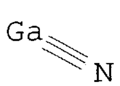
L54 ANSWER 12 OF 51 HCA COPYRIGHT 2004 ACS on STN
134:334531 Substrate with underlayer for heteroepitaxy and epitaxial growth on the substrate. Sunagawa, Haruo; Matsumoto, Yoshishige; Usui, Akira (NEC Corp., Japan). Jpn. Kokai Tokkyo Koho JP 2001122693 A2 **20010508**, 20 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1999-301158 19991022.

AB A heteroepitaxial film free from crystal defects is formed on the substrate as follows. First, a buffer film is formed on a substrate. A **GaN** buffer film is formed on the (0001) surface of a sapphire substrate, for example. The **GaN** buffer film comprises a lower **polycrystal** layer which is prepd. by MOCVD at a low temp. and an upper monocrystal layer which is prepd. by MOCVD at a **high temp.** of .apprx.1050°, for example. The **GaN** buffer film is etched by a soln. so that part of the **GaN** buffer film is left on the substrate like islands. Finally, a **GaN** epitaxial film is formed on the sapphire substrate. The upper monocrystal layer of each **GaN** island acts as a starting point of crystal growth and the **GaN** epitaxial film grows laterally from the starting point of growth, so that a crystal defect-free **GaN** epitaxial film is grown. The **GaN** epitaxial film is removed from the sapphire substrate and is used as the semiconductor laser, etc.

IT **25617-97-4, Gallium nitride**
(substrate with underlayer for epitaxy of material different from the substrate and epitaxial growth on the substrate)

RN 25617-97-4 HCA

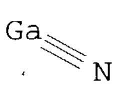
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



IC ICM C30B025-18

ICS C30B029-38; H01L021-205; H01L021-306
CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 73
ST epitaxy substrate underlayer crystal island structure; defect free heteroepitaxy film underlayer substrate; **gallium nitride** epitaxy sapphire substrate underlayer
IT **25617-97-4, Gallium nitride**
(substrate with underlayer for epitaxy of material different from the substrate and epitaxial growth on the substrate)

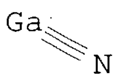
L54 ANSWER 13 OF 51 HCA COPYRIGHT 2004 ACS on STN
134:215049 Investigation of the orientation relationships and growth mechanism of **GaN** epitaxy on silicon.. Ye, Zhi-Zhen; Zhang, Hao-xiang; Zhao, Bing-hui; Wang, Yu; Lui, Hong-xue (State Key Lab. Silicon Materials, Zhejiang Univ., Hangzhou, 310027, Peop. Rep. China). Gongneng Cailiao Yu Qijian Xuebao, 6(4), 305-308 (Chinese) **2000**. CODEN: GCQXFW. ISSN: 1007-4252. Publisher: Gongneng Cailiao Yu Qijian Xuebao Bianjibu.
AB Based on the anal. of the cross-sectional HRTEM image of the **GaN**/Si interface and the SAED images in the interfacial area with a **higher** buffer growth **temp.**, the orientation relation and growth mechanism of **GaN** epitaxy on Si substrates by reactive evapn. method were represented. **GaN** epitaxy started with nucleus formed on the Si substrate, then followed by a **GaN** buffer layer growth at low temp. This **polycryst.** buffer layer recrystd. to highly oriented **GaN** in a micro single crystal form in subsequent **high temp.** annealing, with the orientation relations **GaN**.ltbbrac.0001>//Si<111.rtbbrac. and **GaN**.ltbbrac.1120>//Si<110>. Finally a two-dimension growth in large area followed using the micro single crystals as a template. Also the **GaN** quality was remarkably improved with a **higher** buffer growth **temp.**
IT **25617-97-4, Gallium nitride** (**GaN**)
(orientation relationships and growth mechanism of **GaN** epitaxy on silicon)
RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 75-1 (Crystallography and Liquid Crystals)
ST orientation relationship growth mechanism **gallium nitride** epitaxy silicon

IT Interfacial structure
(anal. of cross-sectional TEM image of **GaN**/Si interface)
IT Crystal orientation
Epitaxy
(orientation relationships and growth mechanism of **GaN** epitaxy on silicon)
IT 7440-21-3, Silicon, properties
(orientation relationships and growth mechanism of **GaN** epitaxy on silicon)
IT **25617-97-4, Gallium nitride** (**GaN**
)
(orientation relationships and growth mechanism of **GaN** epitaxy on silicon)

L54 ANSWER 14 OF 51 HCA COPYRIGHT 2004 ACS on STN
134:64362 Selective area growth of cubic **GaN** on 3C-SiC (001) by metalorganic molecular beam epitaxy. Suda, Jun; Kurobe, Tatsuro; Nakamura, Shigeru; Matsunami, Hiroyuki (Department of Electronic Science and Engineering, Kyoto University, Kyoto, 606-8501, Japan). Japanese Journal of Applied Physics, Part 2: Letters, 39(11A), L1081-L1083 (English) **2000**. CODEN: JAPLD8. ISSN: 0021-4922. Publisher: Japan Society of Applied Physics.
AB Selective area growth (SAG) of cubic **GaN** (c-**GaN**) was performed by metalorg. mol. beam epitaxy (MOMBE). The substrates used in this study were vapor phase epitaxy (VPE)-grown 3C-SiC on Si (001) 4°-off substrates. As a mask, 70-nm-thick SiO2 was formed by thermal oxidn. of 3C-SiC and patterned by photolithog. or focused ion beam (FIB) etching. **GaN** was grown on these patterned 3C-SiC substrates without a low-temp.-grown (LT) buffer layer. At a **high** growth **temp.** (850°C), growth of **GaN** did not occur even on a 3C-SiC surface. At a low temp. (800°C), c-**GaN** was epitaxially grown on a 3C-SiC surface, while **polycryst.** **GaN** (poly-**GaN**) was grown on the SiO2-masked region. Growth of poly-**GaN** on the mask was suppressed by optimizing the growth temp. and V/III supply ratio. The possibility of positioning control for c-**GaN** microcrystals is also presented.
IT **25617-97-4, Gallium nitride** (**GaN**
)
(selective area growth of cubic **GaN** on 3C-SiC (001) by metalorg. mol. beam epitaxy)
RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)

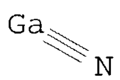


CC 76-2 (Electric Phenomena)
ST **gallium nitride** metalorg epitaxy silicon carbide substrate
IT Sputtering
(etching, ion-beam; selective area growth of cubic **GaN** on 3C-SiC (001) by metalorg. mol. beam epitaxy)
IT Metalorganic molecular beam epitaxy
Photolithography
Vapor phase epitaxy
(selective area growth of cubic **GaN** on 3C-SiC (001) by metalorg. mol. beam epitaxy)
IT Etching
(sputter, ion-beam; selective area growth of cubic **GaN** on 3C-SiC (001) by metalorg. mol. beam epitaxy)
IT Oxidation
(thermal; selective area growth of cubic **GaN** on 3C-SiC (001) by metalorg. mol. beam epitaxy)
IT 7631-86-9, Silica, properties
(mask; selective area growth of cubic **GaN** on 3C-SiC (001) by metalorg. mol. beam epitaxy)
IT **25617-97-4, Gallium nitride** (**GaN**
)
(selective area growth of cubic **GaN** on 3C-SiC (001) by metalorg. mol. beam epitaxy)
IT 409-21-2, Silicon carbide (SiC), properties
(substrate; selective area growth of cubic **GaN** on 3C-SiC (001) by metalorg. mol. beam epitaxy)

L54 ANSWER 15 OF 51 HCA COPYRIGHT 2004 ACS on STN
133:257269 Investigation into the influence of buffer and nitrided layers on the initial stages of **GaN** growth on InSb (100). Haworth, L.; Lu, J.; Westwood, D. I.; Macdonald, J. E. (Department of Physics, University of Wales, Cardiff, CF2 3YB, UK). Applied Surface Science, 166(1-4), 418-422 (English) **2000**. CODEN: ASUSEE. ISSN: 0169-4332. Publisher: Elsevier Science B.V..
AB Radio frequency plasma-assisted mol. beam epitaxy (MBE) growth of **GaN** on InSb (100) was investigated. This combination is interesting because a 45° rotation of a cubic epitaxial **GaN** layer could result in a nearly "lattice-matched" system. The growth of low-temp. buffer layers and initial substrate nitridation at 275° on the morphol. of the subsequent growth at 450° were considered. Nitridation produced a **smooth**, mixed InN and Sb-N layer, while annealing to

450° resulted in the loss of the Sb nitride component and disruption of the InN, causing exposure of the underlying substrate and surface **roughening.** Similarly thin buffer layers (.apprx.8 A) were found to crystallize and island at 450° but allowed substrate damage. By contrast, thicker buffer layers (.apprx.80 Å) remained **smooth** and continuous and protected the substrate but did not crystallize. Subsequent growth morphologies reflected the surface quality of the underlying layers, however all layers were **polycryst.** wurtzite **GaN** and no evidence was found for cryst. cubic **GaN** formation.

IT **25617-97-4, Gallium nitride**
(influence of buffer and nitrided layers on initial stages of **GaN** growth on InSb (100))
RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 66-3 (Surface Chemistry and Colloids)
Section cross-reference(s): 75, 76
ST **gallium nitride** epitaxy indium antimonide surface
IT Nitriding
Semiconductor films
(influence of buffer and nitrided layers on initial stages of **GaN** growth on InSb (100))
IT Surface structure
(influence of buffer and nitrided layers on initial stages of **GaN** growth on InSb (100) in relation to)
IT Molecular beam epitaxy
(radio frequency plasma-assisted; influence of buffer and nitrided layers on initial stages of **GaN** growth on InSb (100) using)
IT **25617-97-4, Gallium nitride**
(influence of buffer and nitrided layers on initial stages of **GaN** growth on InSb (100))
IT 1312-41-0, Indium antimonide
(influence of buffer and nitrided layers on initial stages of **GaN** growth on InSb (100))

L54 ANSWER 16 OF 51 HCA COPYRIGHT 2004 ACS on STN
133:231082 Pulsed laser deposition: a novel growth technique for wide-bandgap semiconductor research. Vispute, R. D.; Enck, R.; Patel, A.; Ming, Bin; Sharma, R. P.; Venkatesan, T.; Scozzie, C. J.; Lelis, A.; McLean, F. B.; Zheleva, T.; Jones, K. A. (CSR Center for Superconductivity Research, University of Maryland, College Park,

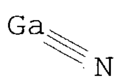
MD, 20742, USA). Materials Science Forum, 338-342(Pt. 2, Silicon Carbide and Related Materials, Part 2), 1503-1506 (English) **2000**. CODEN: MSFOEP. ISSN: 0255-5476. Publisher: Trans Tech Publications Ltd..

AB The present work describes a novel, relatively simple and efficient technique of pulsed laser deposition (PLD) for rapid prototyping of thin films and multilayer heterostructures of wide-bandgap semiconductors and related materials. In this method, a KrF-pulsed excimer laser was used for ablation of **polycryst.**, stoichiometric targets of wide-bandgap materials. Upon laser absorption by the target surface, a strong plasma plume is produced, which then condenses onto the substrate, which is kept at a suitable distance from the target surface. The authors have optimized the processing parameters, such as laser fluence, substrate temp., background gas pressure, target to substrate distance, and pulse repetition rate, for the growth of high-quality thin films and heterostructures of AlN, **GaN**, and their alloys. Application of this technique in the fabrication of high-quality AlN thin films for SiC encapsulation, low-leakage AlN dielec. layers, and epitaxial TiN ohmic contacts for **high-temp.** SiC-based thyristors is discussed.

IT **25617-97-4P, Gallium nitride (GaN)**
(pulsed laser deposition: a novel growth technique for wide-bandgap semiconductor research)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 76-3 (Electric Phenomena)

IT 409-21-2P, Silicon carbide (SiC), uses 24304-00-5P, Aluminum nitride (AlN) 25583-20-4P, Titanium nitride (TiN)
**25617-97-4P, Gallium nitride (GaN)**
(pulsed laser deposition: a novel growth technique for wide-bandgap semiconductor research)

L54 ANSWER 17 OF 51 HCA COPYRIGHT 2004 ACS on STN

132:201223 Growth of bulk, **polycrystalline gallium nitride** and indium nitride at sub-atmospheric pressure. Schultz, Brian D.; Argoitia, Alberto; Hayman, Cliff C.; Angus, John C.; Dyck, Jeffrey S.; Kash, Kathleen; Yang, Nan (Chemical Engineering Dept., Case Western Reserve University, Cleveland, OH, 44106, USA). Proceedings - Electrochemical Society, 98-18(III-V Nitride Materials and Processes), 108-118 (English) **1999**.

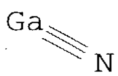
CODEN: PESODO. ISSN: 0161-6374. Publisher: Electrochemical Society.

AB Bulk, **polycryst. GaN** was crystd. at sub-atm. pressures by satg. pure liq. Ga with active N from both ECR and ball plasma microwave sources. Well faceted, **polycryst.** InN was synthesized by the same method. The plasma is far from equil. and provides an extremely high chem. potential of N. This method of satg. the melt circumvents the **high** static **pressures** of N2 used in conventional bulk synthesis. Growth from Ga/In melts can provide greater N soly. and also can give information about phase relations in the Ga/In/N system.

IT **25617-97-4, Gallium nitride** (**GaN**
)
(growth of bulk, **polycryst. gallium nitride** and indium nitride at sub-atm. pressure by satg. pure liq. Ga with active N from both ECR and ball plasma microwave source)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 75-1 (Crystallography and Liquid Crystals)

ST growth **polycryst** gallium indium nitride sub atm pressure

IT Crystallization
(growth of bulk, **polycryst. gallium nitride** and indium nitride at sub-atm. pressure by satg. pure liq. Ga with active N from both ECR and ball plasma microwave source)

IT **25617-97-4, Gallium nitride** (**GaN**
) 25617-98-5, Indium nitride (InN)
(growth of bulk, **polycryst. gallium nitride** and indium nitride at sub-atm. pressure by satg. pure liq. Ga with active N from both ECR and ball plasma microwave source)

IT 7440-55-3, Gallium, reactions 7440-74-6, Indium, reactions
7727-37-9, Nitrogen, reactions
(growth of bulk, **polycryst. gallium nitride** and indium nitride at sub-atm. pressure by satg. pure liq. Ga with active N from both ECR and ball plasma microwave source)

L54 ANSWER 18 OF 51 HCA 

131:344393 Evolution of crystalline orientations of **polycrystalline GaN** on indium tin oxide/glass substrates by nitridation. Park, Doo-Cheol; Fujita, Shizuo; Fujita,

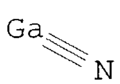
Shigeo; Ko, Hyun-Chul (Department of Electronic Science & Engineering, Kyoto University, Kyoto, 606-8501, Japan). Journal of the Korean Physical Society, 34(Suppl., Proceedings of the 9th Seoul International Symposium on the Physics of Semiconductors and Applications, 1998), S382-S385 (English) **1999**. CODEN: JKPSDV. ISSN: 0374-4884. Publisher: Korean Physical Society.

AB **Polycryst. GaN** on the nitrided In Sn oxide (ITO)/glass substrates with N plasma was grown by radio-frequency plasma-enhanced CVD (PECVD). XPS study revealed that the nitridation of ITO surface proceeded with **higher temp.**, longer time, and higher flow rate of N2 gas. XRD measurements showed that the crystallinity of **GaN** on nitrided ITO/glass was improved compared to that on ITO/glass without the nitridation, and the preferred orientations of (10.hivin.10) and (10.hivin.11) planes of **GaN** were controllable with the nitridation conditions.

IT **25617-97-4, Gallium nitride** (**GaN**
)
(evolution of cryst. orientations of **polycryst. GaN** on indium tin oxide/glass substrates by nitridation in plasma CVD)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 75-2 (Crystallography and Liquid Crystals)

ST **gallium nitride** plasma CVD indium tin oxide nitridation orientation

IT Crystal orientation
Crystallization
Nitriding
(evolution of cryst. orientations of **polycryst. GaN** on indium tin oxide/glass substrates by nitridation)

IT Crystallinity
(of **polycryst. GaN** on nitrided indium tin oxide/glass substrates grown by plasma-enhanced CVD)

IT Vapor deposition process
(plasma; evolution of cryst. orientations of **polycryst. GaN** on indium tin oxide/glass substrates by nitridation in)

IT 50926-11-9, Indium tin oxide
(evolution of cryst. orientations of **polycryst. GaN** on indium tin oxide/glass substrates by nitridation)

IT **25617-97-4, Gallium nitride** (**GaN**
)

(evolution of cryst. orientations of **polycryst.** **GaN** on indium tin oxide/glass substrates by nitridation in plasma CVD)

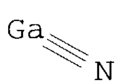
L54 ANSWER 19 OF 51 HCA COPYRIGHT 2004 ACS on STN
131:329190 The growth and characterization of **GaN** grown on a $\gamma$-Al2O3/(001) Si substrate by metalorganic vapor phase epitaxy. Wang, Lianshan; Liu, Xianglin; Zan, Yude; Wang, Du; Lu, Da-Cheng; Wang, Zhanguo; Cheng, Lisen; Zhang, Ze (Laboratory of Semiconductor Materials Science, Institute of Semiconductors, the Chinese Academy of Sciences, Beijing, 100083, Peop. Rep. China). Blue Laser and Light Emitting Diodes II, [International Symposium on Blue Laser and Light Emitting Diodes], 2nd, Chiba, Japan, Sept. 29-Oct. 2, 1998, 93-96. Editor(s): Onabe, Kentaro. Ohmsha: Tokyo, Japan. (English) **1998.** CODEN: 68FVAG.

AB Wurtzite single crystal **GaN** films were grown onto a $\gamma$-Al2O3/Si(001) substrate in a horizontal-type low pressure OMVPE system. A thin $\gamma$-Al2O3 layer is an intermediate layer for the growth of single crystal **GaN** on Si although it is only an oriented **polycrystal** film as shown by reflection high electron diffraction. Also, the oxide is not yet converted to a fully single crystal film, even at the stage of **high temp.** for the **GaN** layer as studied by TEM. Double crystal x-ray linewidth of (0002) peak of the 1.3 $\mu$m sample is 54 arcmin and the films have heavy mosaic structures. A near band edge peaking at 3.4 eV at room temp. is obsd. by photoluminescence spectroscopy. Raman scattering does not detect any cubic phase coexistence.

IT **25617-97-4, Gallium nitride**
(growth and characterization of **GaN** grown on a $\gamma$-Al2O3/(001) Si substrate by metalorg. vapor phase epitaxy)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 73-5 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
Section cross-reference(s): 75

ST growth **gallium nitride** alumina silicon substrate; metalorg vapor phase epitaxy nitride photoluminescence Raman scattering

IT Luminescence
Metalorganic vapor phase epitaxy
Raman spectra

Surface structure
(growth and characterization of **GaN** grown on a $\gamma$-Al2O3/(001) Si substrate by metalorg. vapor phase epitaxy)

IT 1344-28-1, Alumina, uses 7440-21-3, Silicon, uses
(growth and characterization of **GaN** grown on a $\gamma$-Al2O3/(001) Si substrate by metalorg. vapor phase epitaxy)

IT **25617-97-4, Gallium nitride**
(growth and characterization of **GaN** grown on a $\gamma$-Al2O3/(001) Si substrate by metalorg. vapor phase epitaxy)

L54 ANSWER 20 OF 51 HCA COPYRIGHT 2004 ACS on STN

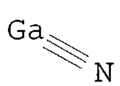
131:235530 Nitride-based compound semiconductor laser device and its manufacture. Ueda, Yoshihiro (Sharp Corp., Japan). Jpn. Kokai Tokkyo Koho JP 11261160 A2 **19990924** Heisei, 9 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1998-58603 19980310.

AB In the laser device, a current-narrowing layer is a highly elec. resistant layer obtained by heating or irradiating charged particles to an amorphous or **polycryst.** nitride compd. semiconductor layer for crystn. The laser device is manufd. by (A) successively growing a 1st **d** clading layer, an active layer, and an amorphous or **polycryst.** nitride semiconductor layer, wet etching the semiconductor layer at $\leq$80° to form stripe-shaped openings, and growing a 2nd clading layer to bury the stripe-shaped openings or (B) successively growing a 1st cladding layer, an active layer, and a 2nd cladding layer, followed by irradn. of charged particles to the cladding layer except the stripe-shaped area to form a current-narrowing layer. The current-narrowing layer shows less absorption coeff. to decrease threshold current at laser oscillation and heat formation.

IT **25617-97-4, Gallium nitride**
(current-narrowing layer; manuf. of nitride-based compd. semiconductor laser device)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)




IC ICM H01S003-18
ICS H01L033-00

CC 73-10 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)

IT **25617-97-4, Gallium nitride**
174141-60-7, Aluminum gallium indium nitride

(current-narrowing layer; manuf. of nitride-based compd. semiconductor laser device)

L54 ANSWER 21 OF 51 HCA COPYRIGHT 2004 ACS on STN

131:26360 Properties and applications of a novel material system, III-N-V. Tu, C. W. (Department of Electrical and Computer Engineering, University of California, San Diego, La Jolla, CA, 92093-0407, USA). Proceedings - Electrochemical Society, 99-4(State-of-the-Art Program on Compound Semiconductors (SOTAPOCs XXX)), 250-259 (English) **1999.** CODEN: PESODO. ISSN: 0161-6374. Publisher: Electrochemical Society.

AB The novel (Ga,In)(N,As) material system exhibits a large bandgap bowing. The As-rich alloy, GaInNAs, pseudomorphic to GaAs, can have room-temp. photoluminescence (PL) at 1.3 μm, but the intensity is weak. It can be improved by rapid thermal annealing, but the PL peak shifts to shorter wavelength due to interdiffusion of In and Ga. The low-temp. PL of GaInNAs/GaAs quantum wells also exhibits quantum-dot-like behavior due to a bimodal distribution of N and In concns. The low-energy peak is attributed to excitons localized at deep levels from quantum-dot-like regions, and the high-energy peak is from quantum wells. On the other hand, transmission electron microscopy of **GaN** grown with As or P shows that low-temp.-grown **GaN** is **polycryst.** and zinc-blende. **GaN** grown with As at **high temp.** (.apprx.750°C) shows hexagonal wurtzite structure, whereas **GaN** grown with P at **high temp.** shows zinc-blende with twinning.

CC 76-3 (Electric Phenomena)
Section cross-reference(s): 56, 57

L54 ANSWER 22 OF 51 HCA COPYRIGHT 2004 ACS on STN

131:25892 Cubic **GaN** formation under nitrogen-deficient conditions. Oktyabrsky, S.; Dovidenko, K.; Sharma, A. K.; Narayan, J.; Joshkin, V. (New York State Center for Advanced Technology, State University of New York at Albany, Albany, NY, 12203, USA). Applied Physics Letters, 74(17), 2465-2467 (English) **1999.** CODEN: APPLAB. ISSN: 0003-6951. Publisher: American Institute of Physics.

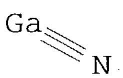
AB The authors have studied crystal structure and assocd. defects in **GaN**/α-Al2O3 (0001) films grown under N-deficient conditions by metalorg. CVD and pulsed laser deposition. N-deficient films exhibit **polycryst.** structure with a mixt. of cubic Zn-blende and wurtzite hexagonal **GaN** grains retaining tetragonal bonding across the boundaries and hence the epitaxial orientations and polarity. Renucleation of the wurtzite phase at different {111} planes of cubic **GaN** results in a **rough** and faceted surface of the film. The authors elucidate that the cubic phase is more stable under the N

deficiency.

IT **25617-97-4, Gallium nitride** (**GaN**
)
(formation of cubic zincblende **gallium nitride**
grains having epitaxial orientations and polarity of Ga-N bonds
across interface with wurtzite grains grown nitrogen-deficient
condition by metalorg. CVD or pulsed laser deposition)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 66

ST **gallium nitride** metalorg CVD laser deposition
nitrogen deficient condition; structure **gallium
nitride** film growth nitrogen deficient condition

IT Crystal orientation
Interface
Polarity
Surface structure
(formation of cubic zincblende **gallium nitride**
grains having epitaxial orientations and polarity of Ga-N bonds
across interface with wurtzite grains grown nitrogen-deficient
condition by metalorg. CVD or pulsed laser deposition)

IT Vapor deposition process
(metalorg.; formation of cubic zincblende **gallium
nitride** grains having epitaxial orientations and polarity
of Ga-N bonds across interface with wurtzite grains grown
nitrogen-deficient condition by metalorg. CVD or pulsed laser
deposition)

IT Vapor deposition process
(pulsed laser; formation of cubic zincblende **gallium
nitride** grains having epitaxial orientations and polarity
of Ga-N bonds across interface with wurtzite grains grown
nitrogen-deficient condition by metalorg. CVD or pulsed laser
deposition)

IT **25617-97-4, Gallium nitride** (**GaN**
)
(formation of cubic zincblende **gallium nitride**
grains having epitaxial orientations and polarity of Ga-N bonds
across interface with wurtzite grains grown nitrogen-deficient
condition by metalorg. CVD or pulsed laser deposition)

L54 ANSWER 23 OF 51 HCA COPYRIGHT 2004 ACS on STN

130:9021 The growth and characterization of **GaN** grown on an

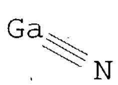
Al2O3 coated (001) Si substrate by metalorganic vapor phase epitaxy.
Wang, Lianshan; Liu, Xianglin; Zan, Yude; Wang, Du; Lu, Da-Cheng; Wang, Zhanguo; Wang, Yutian; Cheng, Lisen; Zhang, Ze (Institute of Semiconductors, Laboratory of Semiconductor Materials Science, The Chinese Academy of Sciences, P.O. Box 912, Beijing, 100083, Peop. Rep. China). Journal of Crystal Growth, 193(4), 484-490 (English) **1998**. CODEN: JCRGAE. ISSN: 0022-0248. Publisher: Elsevier Science B.V..

AB Single crystal **GaN** films were grown on to an Al2O3 coated (00 )Si substrate in a horizontal-type low-pressure metalorg. VPE system. A thin Al2O3 layer is an intermediate layer for the growth of single crystal **GaN** on Si although it is only an oriented **polycrystal** film as shown by RHEED. The oxide was not yet converted to a fully single crystal film, even at the stage of **high temp.** for the **GaN** overlayer as studied by TEM. Double crystal x-ray diffraction showed that the linewidth of (0002) peak of the x-ray rocking curve of the 1.3 μm sample was 54 arcmin and the films had heavy mosaic structures. A near band edge peaking at 3.4 eV at room temp. was obsd. by photoluminescence spectroscopy.

IT **25617-97-4, Gallium nitride** (**GaN**
)
(growth and characterization of **gallium nitride** grown on Al2O3 coated (001) Si substrate by metalorg. VPE)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 75-1 (Crystallography and Liquid Crystals)

ST **gallium nitride** metalorg VPE alumina silica

IT Metalorganic vapor phase epitaxy
(growth and characterization of **gallium nitride** grown on Al2O3 coated (001) Si substrate by)

IT Luminescence
(of **gallium nitride** grown on Al2O3 coated (001) Si substrate by metalorg. VPE)

IT 1344-28-1, Alumina, processes
(growth and characterization of **gallium nitride** grown on Al2O3 coated (001) Si substrate by metalorg. VPE)

IT **25617-97-4, Gallium nitride** (**GaN**
)
(growth and characterization of **gallium nitride** grown on Al2O3 coated (001) Si substrate by metalorg. VPE)

L54 ANSWER 24 OF 51 HCA 

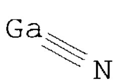
129:348699 x-ray absorption study of the electronic states in **GaN polycrystal** and epitaxial layers.
Lawniczak-Jablonska, K.; Suski, T.; Liliental-Weber, Z.; Gorczyca, I.; Christensen, N. E.; Gullikson, E. M.; Underwood, J. H.; Drummond, T. J. (Institute of Physics, Polish Academy of Sciences, Warsaw, 02-668, Pol.). Molecular Physics Reports, 21, 93-98 (English) **1998**. CODEN: MPREFZ. ISSN: 1505-1250.
Publisher: Osrodek Wydawnictw Naukowych, Polish Academy of Sciences.

AB The 1st measurements of the energy distribution of the N p-antibonding electron states in the hexagonal and cubic epitaxial layers of **GaN** along ab-plane and c-direction as well as from **polycryst.** samples are reported together with Ga **d** + s stetes and compared with the self-consistent linear muffin-tin-orbital (LMTO) band structure calcn. The studies were performed at the Advanced Light Source, Berkeley by the polarized x-ray absorption at the K-edge of N. A strong polarization dependence of the absorption spectra pointing out the significant anisotropy of the conduction band was found in the case of hexagonal sample. Also, very weak polarization dependencies obsd. in cubic samples correspond well with the defect distribution anisotropy. The shape of x-ray absorption edge for **polycryst.** sample in the distance up to 15 eV from the bottom of conduction band is well reproduced by the LMTO calcns. This confirm the validity of the frozen electron approxn. and the validity of the model of the potential used in calcns.

IT **25617-97-4, Gallium nitride** (**GaN**
)
(x-ray absorption study of electronic states in **GaN polycrystal** and epitaxial layers)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 73-6 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
Section cross-reference(s): 65, 78

ST x ray spectra **gallium nitride** epitaxy

IT Electronic state
LMTO (linear muffin-tin orbital)
X-ray spectra
(x-ray absorption study of electronic states in **GaN polycrystal** and epitaxial layers)

IT **25617-97-4, Gallium nitride** (**GaN**
)
(x-ray absorption study of electronic states in **GaN**

**polycrystal** and epitaxial layers)

L54 ANSWER 25 OF 51 HCA 

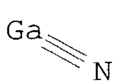
129:238257 Selective area growth of **GaN** using tungsten mask by metalorganic vapor phase epitaxy. Kawaguchi, Yasutoshi; Nambu, Shingo; Sone, Hiroki; Shibata, Takumi; Matsushima, Hidetada; Yamaguchi, Masahito; Miyake, Hideto; Hiramatsu, Kazumasa; Sawaki, Nobuhiko (Departmnent of Electronics, Nagoya University, Furo-cho, Chiktusa-ktu, Nagoya, Aichi, 464-8603, Japan). Japanese Journal of Applied Physics, Part 2: Letters, 37(7B), L845-L848 (English) **1998**. CODEN: JAPLD8. ISSN: 0021-4922. Publisher: Japanese Journal of Applied Physics.

AB Selective area growth (SAG) of **GaN** is studied using a tungsten (W) mask with an atm. metalorg. vapor phase epitaxy (MOVPE) system. No **GaN polycrystals** were obsd. on the W mask regions, and the selectivity of **GaN** growth on window regions proved to be excellent. The **GaN** stripes developed into different shapes depending on the direction of stripe mask patterns. If the stripe was along <1120>, a triangular shape with (1.hivin.101) facets was formed. If the stripe was along <1100>, a trapezoidal shape with a **smooth** (0001) surface on top and **rough** surfaces on both sides was obtained. The lateral overgrowth of **GaN** on the W mask occurred in both cases. The growth mechanisms and the facet formation were similar to those found in SAG using a SiO2 mask.

IT **25617-97-4P, Gallium nitride (GaN)**
(selective area growth of **GaN** using tungsten mask by metalorg. vapor phase epitaxy)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 76-3 (Electric Phenomena)
Section cross-reference(s): 75

ST **gallium nitride** metalorg vapor phase epitaxy

IT Crystals
(faces; selective area growth of **GaN** using tungsten mask by metalorg. vapor phase epitaxy)

IT Metalorganic vapor phase epitaxy
Photomasks (lithographic masks)
(selective area growth of **GaN** using tungsten mask by metalorg. vapor phase epitaxy)

IT 7440-33-7P, Tungsten, properties

(mask; selective area growth of **GaN** using tungsten mask by metalorg. vapor phase epitaxy)

IT **25617-97-4P, Gallium nitride ( GaN)**
(selective area growth of **GaN** using tungsten mask by metalorg. vapor phase epitaxy)

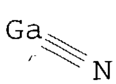
L54 ANSWER 26 OF 51 HCA COPYRIGHT 2004 ACS on STN
129:181532 Promising characteristics of **GaN** layers grown on amorphous silica substrates by gas-source MBE. Iwata, K.; Asahi, H.; Asami, K.; Ishida, A.; Kuroiwa, R.; Tampo, H.; Gonda, S.; Chichibu, S. (The Institute of Scientific and Industrial Research, Osaka University, Osaka, Ibaraki, 567, Japan). Journal of Crystal Growth, 189/190, 218-222 (English) **1998**. CODEN: JCRGAE. ISSN: 0022-0248. Publisher: Elsevier Science B.V..

AB **Polycryst. GaN** layers are grown on amorphous fused silica glass substrates by gas-source MBE using ion removed electron cyclotron resonance (ECR) radical cell. **Polycryst . GaN** grown here shows a strong photoluminescence without deep-level emission. The emission peak with a wide spectral half-width is red shifted from the excitonic emission of a **GaN** layer grown on a sapphire substrate. The peak is excitonic from the excitation power and temp. dependencies of the PL spectrum. Photoluminescence excitation spectra show that the **polycryst. GaN** has a large Stokes shift. The results suggest that the **polycryst. GaN** has a large potential fluctuation due to a grain to grain potential distribution and that the strong emission originates from the lower-energy tail of the absorption spectrum. Such optical properties indicate that the **polycryst. GaN** layers grown on the glass substrates are promising to fabricate large area and low cost light-emitting devices and solar cells. **Polycryst.** optical device technol. will be indispensable for industrial applications as well as the **polycryst.** and the amorphous Si devices.

IT **25617-97-4, Gallium nitride** (GaN )
(luminescent **polycryst.** layers on amorphous silica by gas-source MBE)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 73-5 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)

Section cross-reference(s): 75
ST **gallium nitride** luminescence **polycryst** film; silica glass substrate **gallium nitride** luminescence
IT Molecular beam epitaxy
(gas-source; luminescent **polycryst.** layers of **gallium nitride** on amorphous silica by)
IT Surface **roughness**
(luminescence decay of **polycryst. gallium nitride** film related to)
IT **Polycrystalline** films
(luminescent **polycryst.** layers of **gallium nitride** on amorphous silica by gas-source MBE)
IT Exciton luminescence
Luminescence
(**polycryst.** layers of **gallium nitride** on amorphous silica)
IT **25617-97-4, Gallium nitride** (**GaN** )
(luminescent **polycryst.** layers on amorphous silica by gas-source MBE)
IT 60676-86-0, Vitreous silica
(substrate; luminescent **polycryst.** layers of **gallium nitride** on amorphous silica by gas-source MBE)

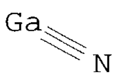
L54 ANSWER 27 OF 51 HCA COPYRIGHT 2004 ACS on STN
129:34633 Pulsed laser deposition of highly crystalline **GaN** films on sapphire. Vispute, R. D.; Talyansky, V.; Chupoon, S.; Enck, R.; Dahmas, T.; Ogale, S. B.; Sharma, R. P.; Venkatesan, T.; Li, Y. X.; Salamanca-Riba, L. G.; Iliadis, A. A.; He, M.; Tang, X.; Halpern, J. B.; Spencer, M. G.; Khan, M. A.; Jones, K. A.; Bel'kov, V.; Botnaryuk, V.; Diakonu, I.; Fedorov, L.; Zhilyaev, Y. (Dept. of Physics, CSR, University of Maryland, College Park, MD, 20742, USA). Materials Research Society Symposium Proceedings, 482(Nitride Semiconductors), 343-348 (English) **1998**. CODEN: MRSPDH. ISSN: 0272-9172. Publisher: Materials Research Society.
AB High quality epitaxial growth of **GaN** film by the pulsed laser deposition technique is reported. In this method, a KrF pulsed excimer laser was used for ablation of a **polycryst** ., stoichiometric **GaN** target. The ablated material was deposited on a substrate kept at a distance of .apprx.7 cm from the target surface and in an NH3 background pressure of 10-5 torr and temp. of 750°. The films (.apprx.0.5 µm thick) grown on AlN buffered sapphire showed a x-ray diffraction rocking curve FWHM of 4-6 arc minutes. The ion channeling min. yield in the surface region was .apprx.3% indicating a high degree of crystallinity. The optical band gap is 3.4 eV. The epitaxial films were shiny, and the

surface root-mean-square **roughness** was .apprx.5-15 nm.
The elec. resistivity of these films was at 10-2-102 Ω-cm with
a mobility >60 cm2V-1s-1 and carrier concn. of 1017-1019cm-3.

IT **25617-97-4, Gallium nitride** (GaN
)
(pulsed laser deposition of highly cryst. **gallium nitride** films on sapphire and characterization)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 73, 76

ST **gallium nitride** epitaxy pulsed laser deposition

IT Electric current carriers
(concn.; of **gallium nitride** epitaxial films grown by pulsed laser deposition)

IT Vapor deposition process
(laser ablation; epitaxy of highly cryst. **gallium nitride** films on sapphire by)

IT Electric current carriers
(mobility; of **gallium nitride** epitaxial films grown by pulsed laser deposition)

IT Cathodoluminescence
Crystallinity
Electric resistance
Luminescence
Surface structure
(of **gallium nitride** epitaxial films grown by pulsed laser deposition)

IT Band gap
(optical; of **gallium nitride** epitaxial films grown by pulsed laser deposition)

IT Vapor phase epitaxy
(pulsed laser deposition of highly cryst. epitaxial **gallium nitride** films on sapphire)

IT 24304-00-5, Aluminum nitride
(epitaxy of **gallium nitride** epitaxial films on sapphire by pulsed laser deposition with buffer layer of)

IT **25617-97-4, Gallium nitride** (GaN
)
(pulsed laser deposition of highly cryst. **gallium nitride** films on sapphire and characterization)

L54 ANSWER 28 OF 51 HCA 

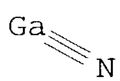
128:302841 Synthesis of bulk, **polycrystalline gallium nitride.** Angus, John C.; Hayman, Cliff C.; Evans, Edward A.; Argoitia, Alberto (Chemical Engineering Department, Case Western Reserve University, Cleveland, OH, 44106, USA). Proceedings - Electrochemical Society, 97-34(III-V Nitride Materials and Processes), 201-208 (English) **1998**. CODEN: PESODO. ISSN: 0161-6374. Publisher: Electrochemical Society.

AB Bulk, **polycryst. Ga nitride** was synthesized from elemental Ga and active N from two microwave plasma sources: a microwave ECR plasma at approx. one millitorr and a ball plasma at 10 torr. Both were used with a source gas of N2. The use of active N obviates the **high pressures** required when **GaN** is grown from N2 and elemental Ga. The **Ga nitride** was characterized by elemental anal., electron diffraction, Raman spectroscopy, and photoluminescence spectroscopy.

IT **25617-97-4, Gallium nitride gan**
(crystn. and spectral characterization of **polycryst. gallium nitride** grown from elemental Ga and active nitrogen in microwave ECR plasma or ball plasma)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 76-11 (Electric Phenomena)
Section cross-reference(s): 75

ST plasma synthesis **polycryst gallium nitride**

IT Luminescence
Raman spectra
(of bulk **polycryst. gallium nitride** grown from elemental Ga and active nitrogen in microwave ECR plasma or ball plasma)

IT Dendrites (crystal)
(of **polycryst. gallium nitride** grown from elemental Ga and active nitrogen in microwave ECR plasma or ball plasma)

IT Crystallization
(plasma-assisted; of bulk **polycryst. gallium nitride** from elemental Ga and active nitrogen in microwave ECR plasma or ball plasma)

IT **25617-97-4, Gallium nitride gan**
(crystn. and spectral characterization of **polycryst. gallium nitride** grown from elemental Ga and active nitrogen in microwave ECR plasma or ball plasma)

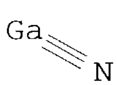
L54 ANSWER 29 OF 51 HCA COPYRIGHT 2004 ACS on STN
128:264440 Annealing of ion implanted **gallium nitride**
. Tan, H. H.; Williams, J. S.; Zou, J.; Cockayne, D. J. H.; Pearton, S. J.; Zolper, J. C.; Stall, R. A. (Research School of Physical Sciences and Engineering, Department of Electronic Materials Engineering, Australian National University, Canberra, ACT 0200, Australia). Applied Physics Letters, 72(10), 1190-1192 (English) **1998**. CODEN: APPLAB. ISSN: 0003-6951. Publisher: American Institute of Physics.

AB The authors examine Si and Te ion implant damage removal in **GaN** as a function of implantation dose, and implantation and annealing temp. Transmission electron microscopy shows that amorphous layers, which can result from high-dose implantation, recrystallize between 800 and 1100[thinsp]°C to very defective **polycryst.** material. Lower-dose implants (down to 5+1013[thinsp]cm-2), which are not amorphous but defective after implantation, also anneal poorly up to 1100[thinsp]°C, leaving a coarse network of extended defects. Despite such disorder, a high fraction of Te is found to be substitutional in **GaN** both following implantation and after annealing. Furthermore, although elevated-temp. implants result in less disorder after implantation, this damage is also impossible to anneal out completely by 1100[thinsp]°C. The implications of this study are that considerably **higher** annealing **temps.** will be needed to remove damage for optimum elec. properties.

IT **25617-97-4, Gallium nitride**
(annealing of ion implanted **gallium nitride**)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 76-2 (Electric Phenomena)

ST annealing ion implanted **gallium nitride**

IT Annealing
Disorder
Ion implantation
Recrystallization
(annealing of ion implanted **gallium nitride**)

IT 7440-21-3, Silicon, processes 13494-80-9, Tellurium, processes
(annealing of **gallium nitride** ion implanted with)

IT **25617-97-4, Gallium nitride**
(annealing of ion implanted **gallium nitride**)

L54 ANSWER 30 OF 51 HCA COPYRIGHT 2004 ACS on STN

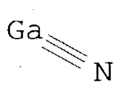
128:186636 Growth and properties of **GaN** on (001) Si substrate with an AlN buffer layers. Lee, Y. J.; Kim, S. T.; Chung, S. H.; Moon, D. C. (Department of Materials Engineering, Taejon National University of Technology, Taejon, 300-717, S. Korea). Han'guk Chaelyo Hakhoechi, 8(1), 38-44 (Korean) **1998.** CODEN: HCHAEU. ISSN: 1225-0562. Publisher: Materials Research Society of Korea.

AB **GaN** layers were grown on (001) Si substrates by the hydride VPE (HVPE) method using RF-sputtered thin film AlN as buffer layers. The **GaN** growth rates depends on thicknesses of AlN buffer layers, and found to be 65 μm/h and 84 μm/h for the AlN thickness of 500 Å and 2000 Å, resp., at the **GaN** growth temp. of 1030°. At the initial stage of the **GaN** grown on (001) Si substrate covered with AlN intermediate layer, randomly oriented crystallites of a few μm size were deposited, leading to **rough** surface morphol. Thereafter with increasing the growth time, each crystallites grew two dimensionally and coalesced with each ones to be **smooth** surface, and became highly c-oriented **polycryst.** At the photoluminescence spectrum measured at 20 K, free-exciton emission at 3.482 eV, neutral donor bound exciton emission at 3.472 eV which had the full-width half at max. of 9.6 meV, and donor-acceptor pair emission at 3.27 eV with LO phonon replicas were obsd., but yellow-band around at 2.2 eV was not detected.

IT **25617-97-4, Gallium nitride** (**GaN**
)
(hydride VPE and optical properties of **GaN** on (001) Si substrate with AlN buffer layers)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 73, 76

ST VPE optical property **gallium nitride** silicon

IT Crystallites
(formation of **gallium nitride** crystallites in initial stage of VPE on AlN buffer layers)

IT Luminescence
Vapor phase epitaxy
(hydride VPE and optical properties of **GaN** on (001) Si substrate with AlN buffer layers)

IT Surface **roughness**

(of **gallium nitride** on (001) Si substrate with AlN buffer layers)

IT 7440-21-3, Silicon, uses
(hydride VPE and optical properties of **GaN** on (001) Si substrate with AlN buffer layers)

IT 24304-00-5, Aluminum nitride (AlN)
(hydride VPE and optical properties of **GaN** on (001) Si substrate with AlN buffer layers)

IT **25617-97-4, Gallium nitride** (**GaN**
)
(hydride VPE and optical properties of **GaN** on (001) Si substrate with AlN buffer layers)

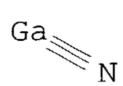
L54 ANSWER 31 OF 51 HCA COPYRIGHT 2004 ACS on STN
127:26532 Microstructural studies of **GaN** grown on (0001) sapphire by MOVPE. Vennegues, P.; Beaumont, B.; Gibart, P. (Cent. Rech. Heterlepitaxie Appl., CRHEA-CNRS, Valbonne, 06560, Fr.). Materials Science & Engineering, B: Solid-State Materials for Advanced Technology, B43(1-3), 274-278 (English) **1997**. CODEN: MSBTEK. ISSN: 0921-5107. Publisher: Elsevier.

AB A TEM study of **GaN** samples grown by metalorg. VPE on (0001) sapphire at different stages of the growth process is presented. The low temp. (600°) buffer layer which is required for high quality **GaN**, exhibits a mixed hexagonal-cubic **polycryst.** microstructure. After a short annealing at **higher temp.** (1050°), cubic islands remain on its top surface. The microstructure of the epilayers could be sepd. in two zones. Close to the interface with sapphire, misfit dislocations, basal stacking faults and 'nanocavities' are present. After a thickness of 0.5 μm, two types of threading defects remain: edge dislocations of 1/3 <11.hivin.20> Burger vector and nanopipes.

IT **25617-97-4, Gallium nitride** (**GaN**
)
(microstructural studies of **gallium nitride** grown on (0001) sapphire by metalorg. VPE)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



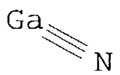
CC 75-12 (Crystallography and Liquid Crystals)
Section cross-reference(s): 66

ST **gallium nitride** microstructure metalorg VPE; defect microstructure **gallium nitride** metalorg VPE

IT Crystal dislocations
(edge; in microstructure of **gallium nitride** grown on (0001) sapphire by metalorg. VPE)
IT Crystal defects
Misfit dislocations
Stacking faults
(in microstructure of **gallium nitride** grown on (0001) sapphire by metalorg. VPE)
IT Metalorganic vapor phase epitaxy
(microstructure of **gallium nitride** grown on (0001) sapphire by)
IT Interfacial structure
Microstructure
(of **gallium nitride** grown on (0001) sapphire by metalorg. VPE)
IT **25617-97-4, Gallium nitride** (**GaN**
)
(microstructural studies of **gallium nitride** grown on (0001) sapphire by metalorg. VPE)

L54 ANSWER 32 OF 51 HCA COPYRIGHT 2004 ACS on STN
126:179217 Hydrogen in **gallium nitride** grown by MOCVD. Ambacher, O.; Angerer, H.; Dimitrov, R.; Rieger, W.; Stutzmann, M.; Dollinger, G.; Bergmaier, A. (Walter Schottky Inst., Technical Univ. Munich, Garching, D-85748, Germany). Physica Status Solidi A: Applied Research, 159(1), 105-119 (English) **1997**. CODEN: PSSABA. ISSN: 0031-8965. Publisher: Akademie Verlag.
AB The role of H in **GaN** was studied on thin films of **GaN** on sapphire prepd. at substrate temps. of 600-1100°. Using Et3Ga and NH3 as precursor and H and/or N as transport gases, a strong influence of mol. H2 on the deposition rate and the structural properties of epitaxial **GaN** was obsd. By elastic recoil detection anal. and thermal desorption measurements we were able to det. the total concn. of N, H, and C in the bulk material. Isotope substitution of H by **D** in the H2 carrier gas did not give rise to a noticeable **D** incorporation, showing that the sources for H are the metalorg. precursor, NH3 or reaction products of both. Once incorporated, thermally activated H effusion from n-type **GaN** occurs with an activation energy of >3.9 eV. With the help of mass spectrometry we established H effusion from heavily Mg-doped (2 at%) **GaN** at 600-700°, which is the temp. range used for acceptor activation.
IT **25617-97-4, Gallium nitride**
(H concn. and distribution in MOCVD **GaN**, its effusion from **GaN**, and its effect on growth behavior of amorphous, **polycryst.** and epitaxial **GaN**)
RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 75-1 (Crystallography and Liquid Crystals)
ST hydrogen epitaxy MOCVD **gallium nitride**; effusion
concn hydrogen **gallium nitride**
IT Effusion (nonbiological)
Metalorganic vapor phase epitaxy
(H concn. and distribution in MOCVD **GaN**, its effusion
from **GaN**, and its effect on growth behavior of
amorphous, **polycryst.** and epitaxial **GaN**)
IT Vapor deposition process
(metalorg.; H concn. and distribution in MOCVD **GaN**, its
effusion from **GaN**, and its effect on growth behavior of
amorphous, **polycryst.** and epitaxial **GaN**)
IT **25617-97-4, Gallium nitride**
(H concn. and distribution in MOCVD **GaN**, its effusion
from **GaN**, and its effect on growth behavior of
amorphous, **polycryst.** and epitaxial **GaN**)
IT 7439-95-4, Magnesium, uses
(H diffusion in and loss from **gallium nitride**
doped with)
IT 1333-74-0, Hydrogen, processes
(concn. and distribution in MOCVD **GaN**, its effusion
from **GaN**, and its effect on growth behavior of
amorphous, **polycryst.** and epitaxial **GaN**)
IT 7727-37-9, Nitrogen, analysis
(total N concn. detn. in H-contg. **GaN** grown by MOCVD)

L54 ANSWER 33 OF 51 HCA COPYRIGHT 2004 ACS on STN
126:54052 Molecular precursors to Group 13 nitrides. 4. Triazidogallium
and derivatives: new precursors to thin films and nanoparticles of
**GaN**. Fischer, Roland A.; Miehhr, Alexander; Herdtweck,
Eberhardt; Mattner, Michael R.; Ambacher, Oliver; Metzger, Thomas;
Born, Ebberhard; Weinkauf, Sevil; Pulham, Colin R.; Parsons, Simon
(Anorganisch-Chemisches Institut, Ruprecht-Karls Universitat,
Heidelberg, D-69120, Germany). Chemistry--A European Journal,
2(11), 1353-1358 Published in: Angew. Chem., Int. Ed. Engl., 35(21)
(English) **1996**. CODEN: CEUJED. ISSN: 0947-6539.
Publisher: VCH.
AB The synthesis and properties of [Ga(N3)3]∞ (1) and the related
derivs. [(Do)nGa(N3)3] (2a-**d**: Do = THF, NEt3, NMe3,
quinuclidine, n = 1, 2e: Do = pyridine; n = 3), Li[MeGa(N3)3] (3),
[(N3)2Ga{(CH2)3NMe2}] (4), [Cp(CO)2FeGa(N3)2(py)] (5), and
[(CO)4CoGa(N3)2(NMe3)] (6) are reported. 2E and 4 were

characterized by single-crystal x-ray diffraction. The deposition of **polycryst. GaN** thin films from 2a-e by soln. methods (spin-on pyrolysis) and the solid-state pyrolysis of 1 to give **GaN** nanoparticles are described. 1 Detonates violently on rapid heating (.apprx.1° s-1) at temps. >280-300°.

IT **25617-97-4P, Gallium nitride ( GaN)**
(polymeric gallium azide and its complexes as precursors to films and nanoparticles of photoluminescent)

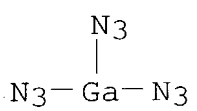
RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)

IT **73157-11-6P**, Gallium azide (Ga(N3)3)
(prepn., accidental detonation, reactions with organolithium reagents and pyrolytic formation of **gallium nitride** nanoparticles from)

RN 73157-11-6 HCA

CN Gallium azide (Ga(N3)3) (9CI) (CA INDEX NAME)



CC 78-7 (Inorganic Chemicals and Reactions)
Section cross-reference(s): 29, 66, 75

ST crystal structure gallium azido complex; gallium azido complex prepn structure pyrolysis; nanoparticle **gallium nitride** azide pyrolysis; film **gallium nitride** azido complex pyrolysis; nitride gallium film nanoparticle formation; safety explosion gallium azide

IT Nanoparticles
(gallium azide as precursor to **gallium nitride** )

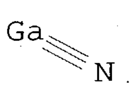
IT Films
(gallium azido complexes as precursors to **gallium nitride**)

IT Luminescence
(of **gallium nitride** formed by pyrolysis of gallium azide)

IT Coating process
(spin-on and solid-state pyrolysis; of **gallium nitride** from polymeric azide or azido complexes)

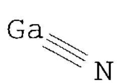
IT **25617-97-4P, Gallium nitride (**
**GaN**)
(polymeric gallium azide and its complexes as precursors to films and nanoparticles of photoluminescent)
IT 184949-72-2P, Triazido(tetrahydrofuran)gallium 184949-73-3P, Triazido(triethylamine)gallium 184949-74-4P, Triazido(trimethylamine)gallium 184949-75-5P
(prepn. and spin-on pyrolysis to give **gallium nitride** thin films)
IT **73157-11-6P**, Gallium azide (Ga(N3)3)
(prepn., accidental detonation, reactions with organolithium reagents and pyrolytic formation of **gallium nitride** nanoparticles from)
IT 180335-72-2P
(prepn., crystal structure and spin-on pyrolysis to give **gallium nitride** thin films)

L54 ANSWER 34 OF 51 HCA COPYRIGHT 2004 ACS on STN
125:289500 Research on **GaN** MODFET's. Eastman, L.; Burm, J.; Schaff, W.; Murphy, M.; Chu, K.; Amano, H.; Akasaki, I. (Dep. Electrical Eng., Cornell Univ., NY, USA). MRS Internet Journal of Nitride Semiconductor Research [Electronic Publication], 1(Avail. URL: http://nsr.mij.mrs.org/1/4/complete.html), No pp. Given (English) **1996**. CODEN: MIJNF7. Publisher: Materials Research Society.
AB A review with 10 refs. Initial results on 0.25 µm gate MODFET's have yielded ft = 21.4 GHz and fmax = 77.5 GHz. These devices have characteristics that agree with the gradual channel model dominated by the electron mobility. The AlGaN/**GaN** structure, grown on sapphire substrates, are **polycryst**., and thus yield low mobility (<100 cm2/Vs) at low electron sheet **d.** Using a simple model, design optimization predicts electron sheet **d** . values of 7.3 + 1012 cm-2 in thin, 3 nm quantum wells for single-sided doping with 5 nm spacer for use in future high frequency Al0.4Ga0.6N/In0.25Ga0.75N/**GaN** MODFET's with gate lengths of 0.10 µm. Double sided doping with 5 nm spacers would yield a sheet **d.** of 1.4 + 10 13 cm-2 in such 3 nm quantum wells.
IT **25617-97-4, Gallium nitride** (**GaN**
)
(developments on **gallium nitride** MODFETs)
RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 76-0 (Electric Phenomena)
ST review **gallium nitride** modulation doped FET; transistor field effect **gallium nitride** review
IT Transistors
(field-effect, modulation-doped; developments on **gallium nitride** MODFETs)
IT **25617-97-4, Gallium nitride** (**GaN**
)
(developments on **gallium nitride** MODFETs)

L54 ANSWER 35 OF 51 HCA COPYRIGHT 2004 ACS on STN
125:235324 Synthesis of ultrafine **gallium nitride** powder by the direct current arc plasma method. Li, H. D.; Yang, H. B.; Yu, S.; Zou, G. T.; Li, Y. D.; Liu, S. Y.; Yang, S. R. (State Key Lab Superhard Materials, Jilin Univ., Changchun, 130023, Taiwan). Applied Physics Letters, 69(9), 1285-1287 (English) **1996**. CODEN: APPLAB. ISSN: 0003-6951. Publisher: American Institute of Physics.
AB Ultrafine **gallium nitride** (**GaN**) powder has been synthesized by the dc arc plasma method through the reaction of metal gallium (Ga) with the mixt. gas of nitrogen (N2) and ammonia (NH3). The analyses of the produced powder by x-ray diffraction, transmission electron microscopy, and selected-area electron diffraction showed that the **GaN** particles in wurtzite structure consisted of nanometer-sized **polycrystals** and monocrystals. The conversion of Ga to **GaN** was detd. by the mixt. ratio of NH3 and N2 in the mixt. gas. The morphol. of the **GaN** particles was mainly hexagonal with the size about 20-200 nm. When heated in air or nitrogen atm., the thermostability of the **GaN** powder was different.
IT **25617-97-4P, Gallium nitride**
(synthesis of ultrafine **gallium nitride** powder by the **d**.c. arc plasma method)
RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 76-2 (Electric Phenomena)
ST **gallium nitride** ultrafine particle prepn plasma
IT Controlled atmospheres
(nitrogen; synthesis of ultrafine **gallium nitride** powder by the **d**.c. arc plasma method)
IT Annealing
Particles
Plasma

(synthesis of ultrafine **gallium nitride** powder by the **d.**c. arc plasma method)

IT 7440-55-3, Gallium, reactions 7664-41-7, Ammonia, reactions 7727-37-9, Nitrogen, reactions
(synthesis of ultrafine **gallium nitride** powder by the **d.**c. arc plasma method)

IT **25617-97-4P, Gallium nitride**
(synthesis of ultrafine **gallium nitride** powder by the **d.**c. arc plasma method)

L54 ANSWER 36 OF 51 HCA COPYRIGHT 2004 ACS on STN

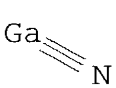
125:181824 Growth of thick **GaN** films by halide vapor phase epitaxy. Perkins, N. R.; Horton, M. N.; Matyi, R. J.; Bandic, Z. Z.; McGill, T. C.; Kuech, T. F. (Materials Sci. Program, Univ. Wisconsin, Madison, WI, USA). Proceedings - Electrochemical Society, 96-5(Chemical Vapor Deposition), 336-341 (English) **1996.** CODEN: PESODO. ISSN: 0161-6374. Publisher: Electrochemical Society.

AB One alternative for the prodn. of **GaN** substrates lies in the deposition of thick **GaN** films on a heteroepitaxial substrate, followed by removal of the film from the substrate. Results are presented for the growth of thick epitaxial **GaN** films by the halide VPE (HVPE) technique on (0001) sapphire and (111) Si substrates. At a temp. of 1030°, films are produced at growth rates between 50 and 90 μm/h, yielding total film thickness exceeding 200 μm on sapphire. HVPE **GaN** films on sapphire show very low levels of luminescence in the common 550 nm (yellow luminescence) region. The room temp. photoluminescence shows strong emission at 3.41 eV, with a FWHM value of 65 meV. At 7 K, the primary emission peak is obsd. 3.48 meV, with a FWHM value of 10.4 meV. The as-grown films on sapphire substrates are transparent and **smooth,** with a morphol. that appears to be dependent on the partial pressure of Ga chloride in the nucleation step. Finally, results are presented for the growth of **GaN** films by HVPE on Si substrates. The **GaN**/Si system is dominated by the formation of Si nitride-based species at the growth interface, resulting **polycryst.** deposition. However, the application of a thin AlN buffer layer produces a sufficient surface for deposition of **GaN** films on Si substrates.

IT **25617-97-4, Gallium nitride** (GaN
)
(halide VPE of thick **GaN** films on sapphire and silicon)

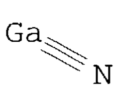
RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 75-1 (Crystallography and Liquid Crystals)
ST **gallium nitride** halide VPE sapphire silicon
IT Luminescence
(of **gallium nitride** films grown by halide VPE on sapphire)
IT Epitaxy
(vapor-phase, of **gallium nitride** thick films on sapphire and silicon by halide method)
IT 24304-00-5, Aluminum nitride (AlN)
(halide VPE of **gallium nitride** thick films on silicon with buffer layer of)
IT **25617-97-4, Gallium nitride** (**GaN**
)
(halide VPE of thick **GaN** films on sapphire and silicon)

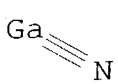
L54 ANSWER 37 OF 51 HCA COPYRIGHT 2004 ACS on STN
124:328736 The first monomeric, volatile bis-azide single-source precursor to **gallium nitride** thin films. Miehr, Alexander; Ambacher, Oliver; Rieger, Walter; Metzger, Thomas; Born, Eberhard; Fischer, Roland A. (Anorg.-Chem. Inst. I, Tech. Univ. Muenchen, Garching, D-85747, Germany). Chemical Vapor Deposition, 2(2), 51-5 Published in: Adv. Mater. (Weinheim, Ger.), 8(3) (English) **1996**. CODEN: CVDEFX. ISSN: 0948-1907. Publisher: VCH.
AB Using (N3)2Ga[(CH2)3NMe2] (I) as a precursor **GaN** films were deposited on (0001) Al2O3 substrates under various low pressure MOCVD conditions using N as a carrier gas and H and NH3 as reactive gases, as well as under vacuum conditions. (I) was synthesized from Cl2Ga[(CH2)3NMe2] and Na3N in quant. yield. Substrate temp. was the dominant factor in the growth of highly oriented **GaN** films from (I) rather than the presence of NH3. Growth rates were between 0.3 μm/h (best crystallog. properties) and 10 μm/h (homogeneous, very **smooth polycryst.** or amorphous nature). The best film was grown without NH3 in vacuo.
IT **25617-97-4P, Gallium nitride**
(metalorg. CVD of **gallium nitride** films from monomeric, volatile bis-azide single-source precursor)
RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 75-1 (Crystallography and Liquid Crystals)
ST **gallium nitride** MOCVD azide precursor; growth rate **gallium nitride** azide precursor

IT Vapor deposition processes
(metalorg. CVD of **gallium nitride** films from monomeric, volatile bis-azide single-source precursor)
IT **25617-97-4P, Gallium nitride**
(metalorg. CVD of **gallium nitride** films from monomeric, volatile bis-azide single-source precursor)

L54 ANSWER 38 OF 51 HCA COPYRIGHT 2004 ACS on STN
124:216439 Investigation of buffer layer of cubic **GaN** epitaxial films on (100) GaAs grown by metalorganic-hydrogen chloride vapor-phase epitaxy. Miura, Yoshiki; Takahashi, Naoyuki; Koukitu, Akinori; Seki, Hisashi (Department of Applied chemistry, Tokyo University of Agriculture and Technology, Koganei, 184, Japan). Japanese Journal of Applied Physics, Part 1: Regular Papers, Short Notes & Review Papers, 35(2A), 546-50 (English) **1996**. CODEN: JAPNDE. ISSN: 0021-4922. Publisher: Japanese Journal of Applied Physics.
AB Cubic **GaN** epitaxial layers are grown with **GaN** buffer layers of various thicknesses on (100) GaAs substrate using Me3Ga, HCl and NH3 as starting materials. The full width at half-max. (FWHM) of the x-ray peak, the surface **roughness** and the PL spectra show that the optimum thickness of the **GaN** buffer layer ranges from 20 to 50 nm. High-resoln. TEM and electron diffraction measurements show that a **GaN** buffer layer grown at 500° is a **polycrystal** and becomes a single crystal upon thermal annealing at 850° for 10 min prior to the growth of a cubic **GaN** epitaxial layer.
IT **25617-97-4, Gallium nitride** (**GaN**
)
(metalorg. VPE of cubic **GaN** on GaAs with **GaN** buffer layer)
RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 75-1 (Crystallography and Liquid Crystals)
ST **gallium nitride** metalorg VPE arsenide buffer
IT Luminescence
(of cubic **GaN** grown by metalorg. VPE on GaAs with **GaN** buffer layer)
IT Epitaxy
(metalorg. vapor-phase, of cubic **GaN** on GaAs with **GaN** buffer layer)
IT Surface structure
(**roughness**, of cubic **GaN** grown by metalorg.

VPE on GaAs with **GaN** buffer layer)

IT **25617-97-4, Gallium nitride** (**GaN**
)
(metalorg. VPE of cubic **GaN** on GaAs with **GaN**
buffer layer)

L54 ANSWER 39 OF 51 HCA COPYRIGHT 2004 ACS on STN

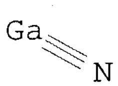
124:104502 **GaN** synthesis by ammonothermal method. Dwilinski, R.; Wysmolek, A.; Baranowski, J.; Kaminska, M.; Doradzinski, R.; Jacobs, H. (Inst. of Experimental Physics, Warsaw Univ., Warsaw, 00-681, Pol.). Acta Physica Polonica, A, 88(5), 833-6 (English) **1995**. CODEN: ATPLB6. ISSN: 0587-4246. Publisher: Polish Academy of Sciences, Institute of Physics.

AB The ammonothermal method can be successfully used to synthesize **GaN** powder of good crystallog. quality from NH3 soln. at **high pressure** and a moderate temp. Thus, gallium nitridation was performed in supercrit. NH3 in an autoclave at up to 550° and 1-5 kbar. Li and K amides play the role of mineralizers in the crystal growth process by facilitating removal of a thin **GaN** layer from the Ga surface to allow completion of reaction. The size of **GaN** powder grains obtained was of a few micrometers. The improvement of the powder cryst. quality (examd. by x-ray rocking curve, SEM and luminescence measurements) with increasing molar proportion of mineralizer was obsd. It was concluded that a high molar proportion of mineralizer in NH3 soln. plays a crucial role in the **polycrystal** growth process. Visible luminescence of high efficiency from the **GaN** powder was found.

IT **25617-97-4P, Gallium nitride** (
**GaN**)
(prepn. and luminescence of cryst. **gallium nitride** from gallium in supercrit. ammonia in presence of lithium or potassium amide)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)




CC 78-5 (Inorganic Chemicals and Reactions)
Section cross-reference(s): 75

ST **gallium nitride** cryst prepn ammonothermal; amide lithium potassium prepn **gallium nitride**; particle size **gallium nitride** ammonothermal prepn; luminescence **gallium nitride** prepn ammonothermal; mineralizer alkali hydroxide **gallium nitride** prepn

IT Luminescence
Particle size
(of cryst. **gallium nitride** prepd. from
gallium in supercrit. ammonia in presence of lithium or potassium
amide)

IT **25617-97-4P, Gallium nitride (**
**GaN**)
(prepn. and luminescence of cryst. **gallium**
**nitride** from gallium in supercrit. ammonia in presence of
lithium or potassium amide)

IT 7782-89-0, Lithium amide 17242-52-3, Potassium amide
(prepn. of cryst. **gallium nitride** from
gallium in supercrit. ammonia in presence of lithium or potassium
amide)

IT 7664-41-7, Ammonia, reactions
(prepn. of cryst. **gallium nitride** from
gallium in supercrit. ammonia in presence of lithium or potassium
amide)

IT 7440-55-3, Gallium, reactions
(prepn. of cryst. **gallium nitride** from
gallium in supercrit. ammonia in presence of lithium or potassium
amide)

L54 ANSWER 40 OF 51 HCA 

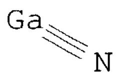
122:227141 **GaN** Film Growth Using Single-Source Precursors.
Lakhotia, Vikas; Neumayer, Deborah A.; Cowley, A. H.; Jones, R. A.;
Ekerdt, J. G. (Department of Chemical Engineering, University of
Texas, Austin, TX, 78712, USA). Chemistry of Materials, 7(3),
546-52 (English) **1995**. CODEN: CMATEX. ISSN: 0897-4756.
Publisher: American Chemical Society.

AB Use of the single-source precursor dimethylgallium azide in the
growth of **GaN** films was explored. Thin **polycryst**
. films with strong (0002) preferred orientation were deposited over
the temp. range 450-650° and the pressure range 2 +
10-5-3 + 10-4 Torr on (100) GaAs, (111) GaAs, (0001) sapphire,
and quartz. Films deposited at the lower temp. (475°) have a
bandgap of .apprx.3.3 eV. At **higher temps**. the
films were darker and cracks were evident on the surface. This
darkening effect can be partially suppressed by the simultaneous use
of dimethylhydrazine. The effect of **GaN** buffer layers
deposited at low **temp**. prior to **high-**
**temp**. film growth was explored. An activation energy of 15
kcal/mol was calcd. for the deposition reaction. An increase in the
precursor partial pressure increases the growth rate sharply.
**GaN** growth was also attempted from
dimethylhydrizodimethylgallium; the resultant films are
**polycryst.**, possessing poor surface morphol.

IT **25617-97-4, Gallium nitride (GaN**

)
(crystn. using dimethylgallium azide of films of)

RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)




CC 75-1 (Crystallography and Liquid Crystals)
ST crystn **gallium nitride** methylgallium azide decompn
IT Surface structure
(of **gallium nitride polycryst.** films)
IT Crystallization
(of **gallium nitride** using dimethylgallium azide)
IT 132240-18-7 162020-24-8
(crystn. of **gallium nitride** films from decompn. of)
IT **25617-97-4, Gallium nitride** (**GaN**
)
(crystn. using dimethylgallium azide of films of)


121:168256 Ar+-ion milling characteristics of III-V nitrides. Pearton, S. J.; Abernathy, C. R.; Ren, F.; Lothian, J. R. (University Florida, Gainesville, FL, 32611, USA). Journal of Applied Physics, 76(2), 1210-15 (English) **1994**. CODEN: JAPIAU. ISSN: 0021-8979.

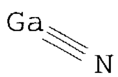
AB Ion milling of thin-film **GaN**, InN, AlN, and InGaN was performed with 100-500 eV Ar+ ions at beam angles of incidence ranging from 0° to 75° from normal incidence. The mill rates normalized to the Ar+ beam current for the single-crystal **GaN**, AlN, and InGaN were typically a factor of 2 lower than for GaAs and InP. For the **polycryst.** InN, the mill rates were similar to those of GaAs and InP. The surface morphol. of the ion-milled nitrides was **smooth** even at 500 eV Ar+ energy, with no evidence for preferential sputtering of the N, a result confirmed by Auger electron energy, with no evidence for preferential sputtering of the N, a result confirmed by Auger electron spectroscopy. The surface region was not amorphized by extended ion milling (35 min) at 500 eV with the samples held at 10 °C, as detd. by Rutherford backscattering. Since the ion mill rates are slow for single-crystal nitrides and less than the mill rates of common masking materials ($SiO_2$, $SiN_x$, photoresist) it appears this technique is useful only for shallow-mesa applications,

and that dry etching methods involving an addnl. chem. component or ion implantation isolation are more practical alternatives for device patterning.

IT **25617-97-4, Gallium nitride**
(argon-ion milling of)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 76-12 (Electric Phenomena)

IT 24304-00-5, Aluminum nitride **25617-97-4, Gallium nitride** 25617-98-5, Indium nitride 106097-44-3, Aluminum **gallium nitride**
(argon-ion milling of)

L54 ANSWER 42 OF 51 HCA 

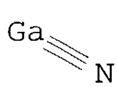
120:204891 Low temperature preparation of **gallium nitride** thin films. Gordon, Roy G.; Hoffman, David M.; Riaz, Umar (Dep. Chem., Harvard Univ., Cambridge, MA, 02138, USA). Materials Research Society Symposium Proceedings, 242(Wide Band Gap Semiconductors), 445-50 (English) **1992**. CODEN: MRSPDH. ISSN: 0272-9172.

AB **GaN** thin films were prepd. by atm. pressure CVD from hexakis(dimethylamido)digallium, $Ga_2(NMe_2)_6$, and $NH_3$ precursors at substrate temps. of 100-400° with growth rates up to 1000 Å/min. The films were characterized by TEM, XPS. Rutherford backscattering spectrometry and forward recoil spectrometry. The N/Ga ratio varied from 1.05 for films deposited at 400° to 1.5 at 100°. The H concn. increased from 10 atom ° for films deposited at 400° to 24 atom ° at 100°. Films deposited at 100° were amorphous but films deposited at **higher temps**. were **polycryst**. Band gaps of the films varied from 3.8 eV for films deposited at 400° t 4.2 eV at 100°.

IT **25617-97-4, Gallium nitride** (**GaN**)
(metalorg. CVD of, from hexakis(dimethylamido)digallium, temp. effect on crystallinity of)

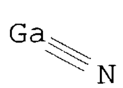
RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 75-1 (Crystallography and Liquid Crystals)
ST metalorg CVD **gallium nitride** low temp
IT Crystallization
(of **gallium nitride** films, during CVD)
IT Vapor deposition processes
(of **gallium nitride**, thermal decompn. of hexakis(dimethylamido)digallium, temp. effect on crystallinity of)
IT **25617-97-4, Gallium nitride** (GaN
)
(metalorg. CVD of, from hexakis(dimethylamido)digallium, temp. effect on crystallinity of)
IT 57731-40-5, Hexakis(dimethylamido)digallium
(thermal decompn. of, in CVD of **gallium nitride**
)

L54 ANSWER 43 OF 51 HCA COPYRIGHT 2004 ACS on STN
119:281832 Electroluminescent device and manufacture thereof. Sasaki, Tooru; Matsuoka, Takashi (Nippon Telegraph & Telephone, Japan). Jpn. Kokai Tokkyo Koho JP 05041541 A2 **19930219** Heisei, 6 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1991-219179 19910805.
AB The title device, capable of emitting visible (IR) to UV light, is made by a process comprising the steps of: heating a sapphire substrate in a N-contg. gas atm., thereby converting the surface layer to a monocryst. AlN;. Depositing a **polycryst.** or amorphous AlN buffer layer by a reaction of an Al-contg. gas with the nitride surface; annealing the AlN butter layer at a **temp. higher** than the deposition temp.; and forming an electroluminescence layer contg. ≥1 AlGaInN layer(s).
IT **25617-97-4P, Gallium nitride**
(electroluminescent device, manuf. of)
RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



IC ICM H01L033-00
ICS H01L021-205; H01L027-12
CC 73-12 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
Section cross-reference(s): 76
IT 24304-00-5P, Aluminum nitride **25617-97-4P, Gallium nitride** 120994-22-1P, Aluminum indium nitride ((Al,In)N) 120994-23-2P, Gallium indium nitride ((Ga,In)N) 127575-65-9P,

Aluminum gallium indium nitride ((Al,Ga,In)N)
(electroluminescent device, manuf. of)

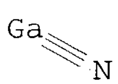
L54 ANSWER 44 OF 51 HCA COPYRIGHT 2004 ACS on STN
115:219147 Trimethylamine gallane as a precursor to cubic **gallium nitride** and gallium arsenide, metal hydride chemical vapor deposition. Gladfelter, Wayne L.; Hwang, Jen Wei; Phillips, Everett C.; Evans, John F.; Hanson, Scott A.; Jensen, Klavs F. (Dep. Chem., Univ. Minnesota, Minneapolis, MN, 55455, USA). Materials Research Society Symposium Proceedings, 204(Chem. Perspect. Microelectron. Mater. 2), 83-93 (English) **1991**. CODEN: MRSPDH. ISSN: 0272-9172.

AB Cyclo-trigallazane, [H2GaNH2]3, is known to form bulk powders of the new cubic phase of **gallium nitride** upon pyrolysis. An explanation for this unusual example where the mol. structure of the precursor controls the crystal structure of the solid state product is presented. In a hot-wall atm. pressure, chem. vapor deposition reactor, arsine reacts with trimethylamino gallane to form films of **polycryst.** GaAs which were characterized by XPS and x-ray diffraction. The growth rates for **smooth** films is 1-4 μm/h. In a low pressure CVD reactor, elemental As vapor reacts with TMAG to give GaAs thin films.

IT **25617-97-4**, Gallium mononitride
(crystn. of, from pyrolysis of cyclotrigallazane)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 78

IT Crystallization
(of **gallium nitride** and gallium arsenide from organometallic vapor phase reactions)

IT **25617-97-4**, Gallium mononitride
(crystn. of, from pyrolysis of cyclotrigallazane)

IT 127972-23-0, Cyclotrigallazane
(pyrolysis of, crystn. of **gallium nitride** from)

L54 ANSWER 45 OF 51 HCA COPYRIGHT 2004 ACS on STN
115:171164 Epitaxial growth of zinc blende and wurtzitic **gallium nitride** thin films on (001) silicon. Lei, T.; Fanciulli, M.; Molnar, R. J.; Moustakas, T. D.; Graham, R. J.; Scanlon, J. (Mol. Beam Epitaxy Lab., Boston Univ., Boston, MA, 02215, USA). Applied Physics Letters, 59(8), 944-6 (English) **1991**.

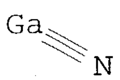
CODEN: APPLAB. ISSN: 0003-6951.

AB Zinc blende and wurtzitic **GaN** films were epitaxially grown on (001)Si by electron cyclotron resonance microwave plasma-assisted mol. beam epitaxy, using a 2-step growth process. In this process a thin buffer layer is grown at relatively low temps. followed by a **higher temp.** growth of the rest of the film. **GaN** films grown on a single cryst. **GaN** buffer have the zinc blende structure, while those grown on a **polycryst**. or amorphous buffer have the wurtzitic structure.

IT **25617-97-4, Gallium nitride** (GaN)
    (epitaxy of, of zinc blende and wurtzite types, on silicon, plasma-assisted mol.-beam)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)




CC 75-1 (Crystallography and Liquid Crystals)

ST **gallium nitride** epitaxy silicon; MBE
**gallium nitride** silicon

IT Epitaxy
    (mol.-beam, of **gallium nitride** of zinc blende and wurtzite types on silicon, electron cyclotron resonance microwave plasma-assisted)

IT **25617-97-4, Gallium nitride** (GaN)
    (epitaxy of, of zinc blende and wurtzite types, on silicon, plasma-assisted mol.-beam)

L54 ANSWER 46 OF 51 HCA COPYRIGHT 2004 ACS on STN

106:11321 OMVPE of **gallium nitride** and aluminum nitride films by metal alkyls and hydrazine. Gaskill, D. K.; Bottka, N.; Lin, M. C. (Nav. Res. Lab., Washington, DC, 20375-5000, USA). Journal of Crystal Growth, 77(1-3), 418-23 (English) **1986**. CODEN: JCRGAE. ISSN: 0022-0248.

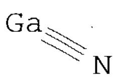
AB Thin films of **GaN** were grown on Al2O3, Si, and GaAs by organometallic VPE using Me3Ga and hydrazine in N2 at atm. pressure. Growth proceeded by the formation of a room temp. adduct which decompd. to form **GaN** in the temp. range 425-960°. Growth efficiencies were .apprx.3 μm/mmol (of Me3Ga) for growth temps. >650°. The films grown below 600° were yellow and **polycryst.** on all substrates. Hall mobilities as large as 50 cm2/V.s (n = 1 + 1020 cm-3) were obtained for films grown at 900° with V/III = 20. The mobilities were .apprx.1 cm2/V s (n = 6 + 1019 cm-3) below 650°. The

impurities in the films were O (≈2%) and C (<1%) for all growth temps. Ests. were made for the room temp. longitudinal optical and transverse optical phonons of 92 and 67 meV, resp. UV transmission data and the photoresponse of the films show an impurity band .apprx.2.5 ev below the conduction band, probably due to O related defects. AlN was also deposited via the decompn. of an adduct formed by the room temp. reaction between Me3Al and N2H4. Films deposited at 575 and 785° had a **rough** surface morphol.

IT **25617-97-4**
(epitaxy of, organometallic vapor-phase, using metal alkyls and hydrozine)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 76

ST VPE **gallium nitride** metal alkyl hydrazine; aluminum nitride VPE metal alkyl hydrazene; Hall mobility **gallium nitride** epitaxial

IT Hall effect
(of **gallium nitride**, grown by organometallic VPE using metal alkyls and hydrazine)

IT Epitaxy
(vapor-phase, metalorg., of **gallium nitride** and aluminum nitride, using metal alkyls and hydrzaine)

IT 1333-74-0, properties
(epitaxy of **gallium nitride** and aluminum nitride using metal alkyls and)

IT 24304-00-5 **25617-97-4**
(epitaxy of, organometallic vapor-phase, using metal alkyls and hydrozine)

IT 105856-71-1 105856-72-2
(pyrolysis of, in growth of **gallium nitride** films)

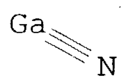
L54 ANSWER 47 OF 51 HCA COPYRIGHT 2004 ACS on STN

96:26948 **High-pressure** vapor growth of **gallium nitride.** Karpinski, J.; Porowski, S.; Miotkowska, S. (High Pressure Res. Cent. Unipress, Polish Acad. Sci., Warsaw, Pol.). Journal of Crystal Growth, 56(1), 77-82 (English) **1982.** CODEN: JCRGAE. ISSN: 0022-0248.

AB The thermal stability of **GaN** was investigated N2 to ≥20 kbar and at ≥1700°. **GaN**

**polycryst.** epitaxial layers were grown on sapphire by sublimation-condensation process in N2 to $\geq$10 kbar and at substrate temps. to $\geq$1200°. As a function of the growth condition the resistivity of the undoped layers varied from 103 to 1014 $\Omega$ cm. The layers were examd. by electron microscope and diffraction patterns obtained.

IT **25617-97-4**
(epitaxy of, under **high pressure**)
RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



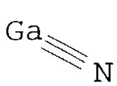
CC 75-1 (Crystallography and Liquid Crystals)
ST epitaxy **polycryst gallium nitride;**
resistivity **gallium nitride polycryst**
IT Electric resistance
(of **gallium nitride polycrystal**
epitaxial layers)
IT Epitaxy
(vapor-phase, of **gallium nitride**)
IT **25617-97-4**
(epitaxy of, under **high pressure**)

L54 ANSWER 48 OF 51 HCA COPYRIGHT 2004 ACS on STN
86:49857 Electroluminescent semiconductor device. (RCA Corp., USA). Brit. GB 1448285 **19760902**, 6 pp. (English). CODEN: BRXXAA. APPLICATION: GB 1973-48146 19731016.
AB A 3-contact electroluminescent device capable of emitting blue, green, and red light from 1 face comprises a **GaN** body which emits blue or green light depending on the polarity of a **d.**c. supply across its 2 contacts and a Group IIIA-VA compd. diode adjacent a transparent substrate for the **GaN;** this diode emitting red light when forward biased. Thus, n-**GaN** (cond. 102 $\Omega$-1) and an insulating layer of **polycryst** . n-**GaN** compensated with acceptors are deposited on a sapphire substrate by vapor phase epitaxy. A Group IIIA-VA compd. p-n junction is deposited on the opposite face of the substrate. Half the junction does not contact the sapphire and is connected to an external elec. contact. The other 2 contacts are to the insulating **GaN** and to a Ni strip along the device edge which contacts the n-**GaN** and sapphire layers and the adjacent Group IIIA-VA compd. layer.
IT **25617-97-4**
(electroluminescent diodes, with multicolor emission)
RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)

IC H01L033-00
CC 76-13 (Electric Phenomena)
ST electroluminescence diode triple wavelength; **gallium nitride** electroluminescence diode; Group IIIA VA electroluminescence
IT Electroluminescent devices
(**gallium nitride** diode, with multicolor emission)
IT **25617-97-4**
(electroluminescent diodes, with multicolor emission)

L54 ANSWER 49 OF 51 HCA COPYRIGHT 2004 ACS on STN
84:68002 **High pressure** solution growth of **gallium nitride.** Madar, R.; Jacob, G.; Hallais, J.; Fruchart, R. (Lab. Electron. Phys. Appl., Limeil-Brevannes, Fr.). Journal of Crystal Growth, 31, 197-203 (English) **1975**. CODEN: JCRGAE. ISSN: 0022-0248.
AB An internally heated pressure vessel was used to study the decompn. reaction of **GaN** at temps. above 900° and the phase equilibria in the system Ga-N2. As a consequence of these studies the crystal growth of **GaN** free crystals and epitaxial layers on sapphire by a vapor-liq.-solid process was undertaken. High-quality epitaxial layers were synthesized showing the terrace structure typical of liq.-phase epitaxy. As a function of the growth conditions both n- and p-type **GaN** were obtained, the latter only in **polycryst.** form.
IT **25617-97-4**
(growth of single crystal and epitaxial layers of, by vapor-liq.-solid process)
RN 25617-97-4 HCA
CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 75-1 (Crystallization and Crystal Structure)
ST **gallium nitride** crystal growth epitaxy
IT Crystal growth
(of **gallium nitride**, by vapor-liq.-solid technique)
IT Epitaxy

(of **gallium nitride**, on sapphire)

IT **25617-97-4**
(growth of single crystal and epitaxial layers of, by vapor-liq.-solid process)

L54 ANSWER 50 OF 51 HCA COPYRIGHT 2004 ACS on STN

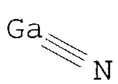
81:112449 Space-charge-limited current flow in **gallium nitride** thin films. Vesely, J. C.; Shatzkes, M.; Burkhardt, P. J. (Syst. Prod. Div., IBM, Hopewell Junction, NY, USA). Physical Review B: Solid State, 10(2), 582-90 (English) **1974**. CODEN: PLRBAQ. ISSN: 0556-2805.

AB **Polycryst. GaN** thin films, 1-5 μ thick, were deposited on degenerate Si substrates by reactive radio-frequency sputtering at 45°. The resulting elec. characteristics were interpreted in terms of space-charge-limited current flow in the presence of 2 discrete trap levels. Anal. of the data indicated an equil. electron concn. of 5.2 + 103-7.8 + 104 cm-3, carrier mobility of 330 cm2/V-sec, and **d.** of traps located 0.81 and 0.39 eV below the conduction band edge of 3.7 + 1014 and 1.9 + 1019 cm-3, resp. The effect of post-heat treatments in a continuous N gas flow decreased the carrier mobility and increased the concn. of shallow traps while maintaining the **d.** of the deeper traps approx. const. At large elec. fields (E > 4 + 105 V/cm), a hot-electron effect was dominant.

IT **25617-97-4**
(space-charge-limited current and trapping in sputtered films of)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)



CC 71-2 (Electric Phenomena)

ST space charge limited current; **gallium nitride** film trapping; carrier mobility **gallium nitride**

IT Trapping and Traps
(in **gallium nitride** sputtered films on silicon)

IT Electric current carriers
(mobility of, in **gallium nitride** sputtered films on silicon)

IT Sputtering
(of **gallium nitride** films on silicon)

IT Electric current
(space-charge-limited, in **gallium nitride** sputtered films)

IT **25617-97-4**

(space-charge-limited current and trapping in sputtered films of)

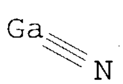
L54 ANSWER 51 OF 51 HCA COPYRIGHT 2004 ACS on STN
74:103936 Growth of epitaxial layers of **gallium nitride** on silicon carbide and corundum substrates.
Wickenden, Dennis K.; Faulkner, K. R.; Brander, R. W.; Isherwood, B. J. (Hirst Res. Cent., Gen. Electr. Co., Ltd., Wembley, UK). Journal of Crystal Growth, 9(1), 158-64 (English) **1971**. CODEN: JCRGAE. ISSN: 0022-0248.

AB Single-crystal epitaxial layers of **GaN** have been grown on α-SiC and α-Al2O3 substrates at 1000-1150°. At lower temps. **polycryst.** deposits are obtained, while at **higher temps.** extensive decompn. of the layers becomes apparent. Epitaxial relations developed are (0001)α-SiC.dblvert.(0001) **GaN**, (10.hivin.10)α-Al2O3.dblvert.(10.hivin.15)**GaN**, (0001)α-Al2O3.dblvert.(0001)**GaN**, and (11.hivin.20)α-Al2O3.dblvert.(0001)**GaN**. The **GaN** adheres badly to the α-SiC and tends to shatter upon cooling. The best **GaN** surface finishes are obtained with (0001) Czochralski and (11.hivin.20) flame fusion corundum substrates.

IT **25617-97-4**
(epitaxy of, on aluminum oxide and silicon carbide)

RN 25617-97-4 HCA

CN Gallium nitride (GaN) (6CI, 8CI, 9CI) (CA INDEX NAME)




CC 70 (Crystallization and Crystal Structure)

ST epitaxial growth **gallium nitride**; silicon carbide substrates; corundum substrates

IT Epitaxy
(of **gallium nitride**, on aluminum oxide and silicon carbide)

IT **25617-97-4**
(epitaxy of, on aluminum oxide and silicon carbide)

IT 409-21-2, properties 1302-74-5 1344-28-1, properties
(epitaxy on, of **gallium nitride**)